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Our experts' verdict

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Ex-id guru Jon Romero on the making of DOOM

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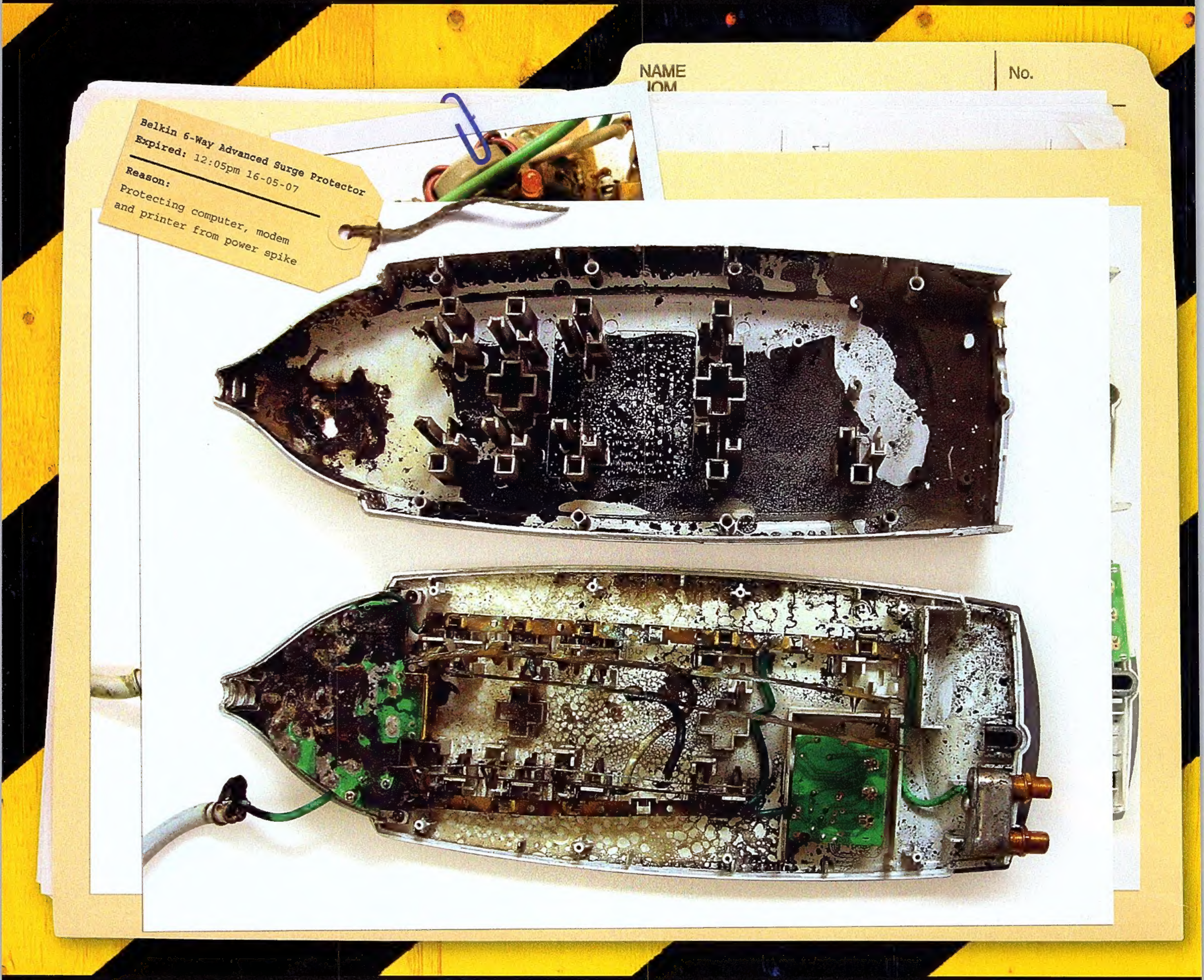
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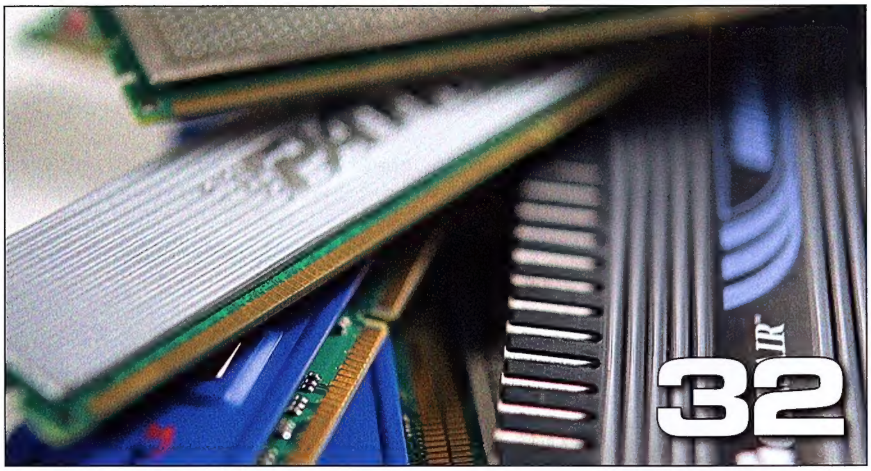

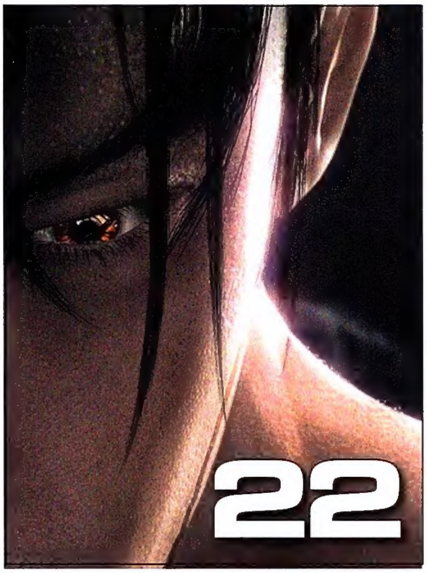

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Logan's last words. Wait, not his *last words*, his... you know what we mean.

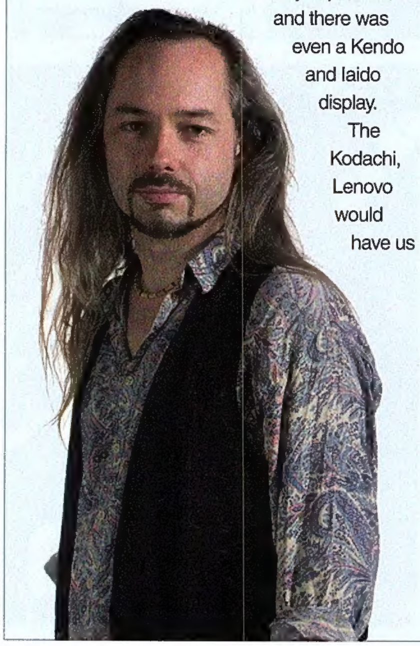
EDHEAD

Turning Japanese

There was nothing quite so exciting over this last month as my zero g flight sadly, which is a shame - it's always nice to have something so clear cut to write about. Like most Editors I know – and we're a tight-knit bunch that can be found lurking in dim pubs nursing a neat double whisky – I leave the writing of my column to the last minute, and often sit there, staring at a blank In Design document for what seems like hours...

Then, eventually, inspiration strikes. Or not, and that's what gets you one of those lame run downs of what's coming up in the issue. Thankfully, I'm inspired.

I recently went along to the launch of Lenovo's (which, in itself, is a name I will never get used to) latest business laptop – the rather extravagantly named Kodachi. The launch was all very Japanese, and there was even a Kendo and Iaido display.



The Kodachi, Lenovo would have us know, is one of the favoured swords of the Samurai, those skilled swordsmen of feudal Japan. Forget the katana or wakazashi, the Kodachi is the meanest of the lot.

Well... no, actually.

In actual fact, while the kodachi was sometimes used by the Samurai, it was far more well known as being a blade popular amongst the merchant class, as it was short enough so that they could legally carry it. Japan's ruling classes were kinda funny about non-samurai carrying around large chunks of sharp steel.

Which, ironically, is rather appropriate. The users of such business machines may well want to be known as 'road warriors'; they may read Sun Tzu and feel that their tactical acumen can cut like a master-forged blade through boardroom politics. But the honest truth is they're no different from their ancient forebears who wore those kodachi as they went about buying grain and acting as bandit fodder so Toshiro Mifune could save them from the big bad ronin.

Do I have a point? Well, not really, other than this is my personal bit of the magazine, and that kind of naming flim-flammery has always gotten my goat. It's right up there with vendors like Sony, who have a habit of simply picking seven random letters and numbers out of hat to name their Viao laptops.

And if you're wondering why I was actually at a business product launch, well, those Iaido guys were great, and it's something I've always wanted to get into. One business card exchange later (which is itself pretty damn odd), and I'll be hooking up with them for some training very soon.

Maybe I can get my boss to cover costs...

David Hollingworth
dhollingworth@atomicmpc.com.au

Issue 85 winners: Yamaha Prize: j Klotz, Melbourne, VIC. Blacksite: C Lee, Concord, NSW; T Iomazzo, Glenelg, SA; A Masters, North, NSW; L Geyer, Sunbury, VIC; M Anderson, Gold, QLD. PocketSurfer2: A Djaja, Eight Mile Plains, QLD.

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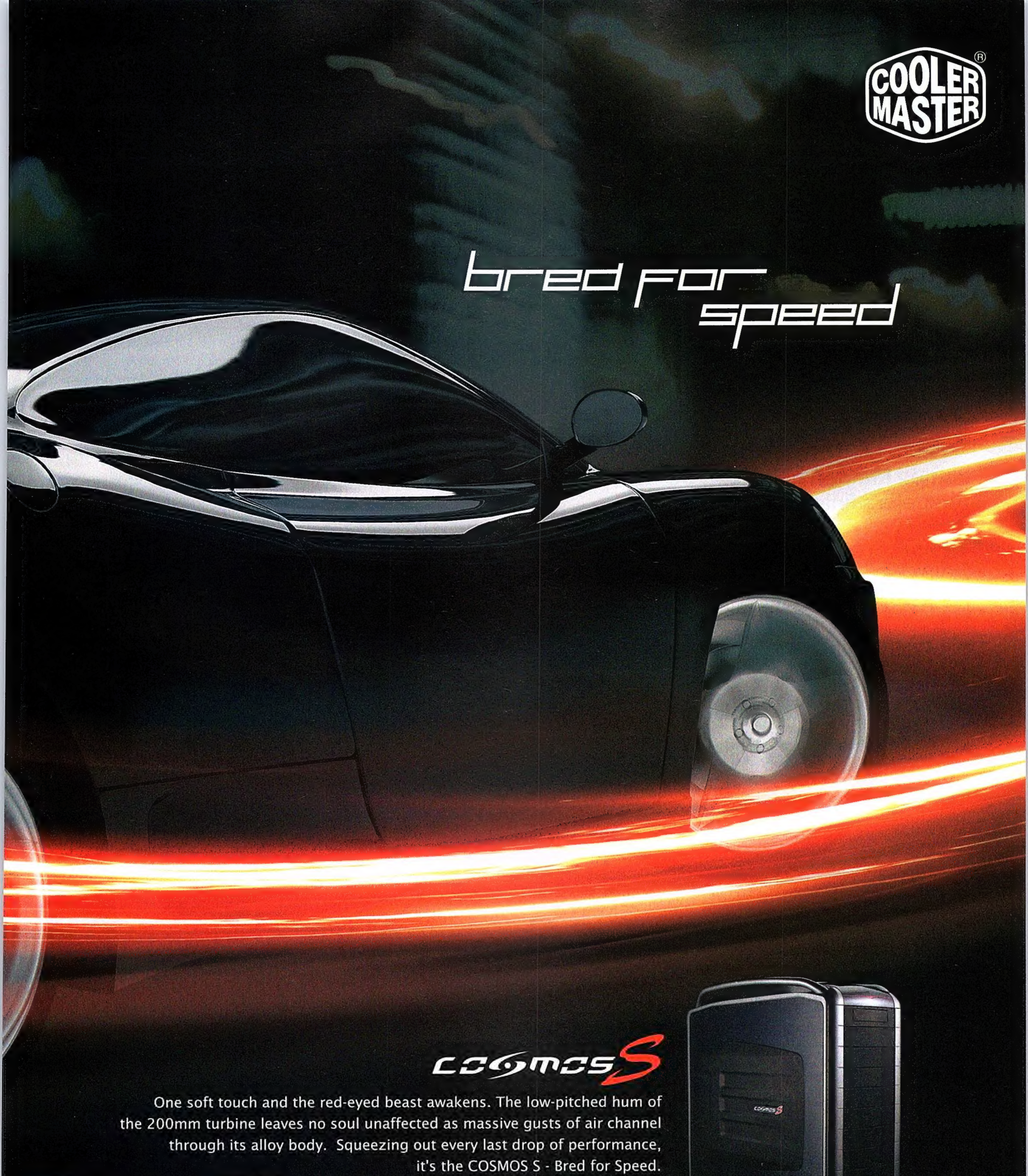

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Dissecta

game fan game maker events

GDC 08 Debrief

James Matson gets the GDC 08 rundown from some of Australia's finest developers.

San Francisco is a beautiful city. If the nostalgic cable cars, uneven streets and boardwalk cafés don't grab you, the maelstrom of geek activity around the GDC (Game Developers Conference) will. For those not lucky enough to rub shoulders with gaming industry giants at US events like the GDC or DICE, the avenue exists to live vicariously through the tales brought back by Aussie game developers who attend these summits. Atomic caught up with Tom Crago (CEO of Tantalus and President of the Game Developers Association of Australia) and Rob Murray (CEO of mobile games developer Firemint) at the recent Dissecta GDC 08 Debrief in Melbourne to get their take on two of the biggest events on the gaming calendar. Although the GDC is the bigger of the two industry events, Tom favors DICE as the place to be,

"Although DICE is relatively new, it's my favorite event on the video game calendar" he says. "It's the only event where we actually get to attend the seminars and lectures."

For developers like Tantalus, DICE is seen as the business end of the agenda, "DICE has one track, and it's really focused on the CEO level, and done on a smaller scale" he comments. "They try to make it a casual networking type event, and it's intimate enough that you can just be strolling around and bump into the head of Kanomi".

But, since the demise of the E3 show, GDC is easily the behemoth affair for the gaming industry to attend. The show floor was bigger this year than ever before, and a not inconsiderable amount of Australian talent was represented. In particular we seem to have a knack for capturing the middleware market, with Bigworld (makers of MMO client/API technology) having a strong presence. The icing on the good news cake for the Australian games industry came in the form of *Puzzle Quest*, by Melbourne-based Infinite Interactive, taking out the award for 'best downloadable game' at the DICE summit. We were lucky enough to catch up with Steve Fawkner at the Debrief, and the man is a shining plasmid of positive energy about the future of the *Puzzle Quest* series, possibly more excited than a man of his age should be, and we love it.

The hot topics – at GDC in particular – centered on merger buzz. The big fish eating little fish mentality (Activision/Blizzard et al) is a major talking point among developers and publishers at both events, but optimism remains high that, for the most part, publishers won't mess with franchises that work. Console talk was also rife, with good and bad vibes on the horizon, depending on the console in question. There's lots of renewed optimism about Sony's PSP and PS3 lines, both thought at one stage to be dying slowly, but the development pipeline looks strong. Tom also mentioned the current phenomenon of nerves around the Nintendo Wii and DS.

"There's a bit of hesitation around Wii and DS at the moment if the GDC is anything to go by; a lot of titles haven't worked so well and publishers are starting to become aware of it."

For Rob Murray, the focus was on the mobile offerings at GDC. "The iPhone presented consumers and developers with a new standard. It sold like hotcakes and now every manufacturer is racing to get the next touch screen enabled phone on the market, giving developers a way to create a better experience in games or apps".

The latest tech from mobile manufacturers is a huge leap forward, with Nvidia showing off a high definition 720p handheld tablet screen and Rob likening some of the other mobile hardware as "a PS2 with shaders, or a cut-down XBOX360". The handheld market could prove a retail battleground between chip manufacturers, as Intel pushes dual core for phones while industry veterans of mobile architecture ARM look to stave off the chip giant.

So there it is, GDC and DICE down for 2008, two whirlwinds of industry steering the still fresh-faced gaming world towards a new year of consoles, Aussie talent, crazy phones and – hopefully – another bundle of incredible games.

> "The show floor was bigger this year, and a good amount of Australian talent was on show."

SHORT CIRCUITS

GAUNTLET II
LEVEL 13
WIZARD
4x SCORE HEALTH
23299 2023
ELF
SCORE HEALTH
22960 4637
VALKYRIE
3x SCORE HEALTH
71725 4824
WIZARD
3x SCORE HEALTH
8610 7654

Throwing the gauntlet down on DS.

Cries of 'Blue wizard needs food, badly!' are expected to usher forth from Nintendo DS players soon, as the ESRB let slip recently that *Gauntlet* – that most lovable RPG action game – has been submitted for classification for Nintendo's handheld. *Gauntlet* has been ported to just about every platform ever conceived since the game's creation in the mid 80s, due in no small part to the fact it's a classic example of pure unadulterated fun in a video game.

The world of RPGs is sticking by the axiom 'bigger is better' with the environment of up-coming radioactive RPG *Fallout 3* rumored to be roughly 80 per cent the size of *Oblivion*, and *Oblivion* – as we all know – was absolutely massive. In terms of exploration value for those that like to roam the news is good, but the danger of running out of creative spark when attempting to design worlds on such a massive scale leaves us wondering whether smaller, higher quality environments might be the best bet.

World of eSports

Make your Sundered Armor count.

Although it came as a surprise, when you get right down to it Blizzard announcing a global Player-versus-Player eSports tournament for *World Of Warcraft* makes perfect sense. A sizable chunk of subscribers to the MMO get their thrills from PvP combat via the games in-built Arena system, so Blizzard offering up $US75,000 in cash prizes as part of a professional tournament is sure to attract interest. Blizzard CEO Mike Morhaime confirms that the concept is aimed at those with a love of the PvP aspect, "eSports is one of the most exciting facets of online gaming. We're pleased to expand *World of Warcraft*'s tournament options to those who focus mainly on the competitive aspects of the game."

Aroulaarabis
<Neverwind Council>
Helgore
<Aroulaarabis's
Dikifm

Obviously to ensure team balance, players will be able to create characters with level 70 'epic' items purely for the purposes of the online tournament. Unfortunately Australia doesn't appear in the list of qualifying regions, with Europe, the USA, South Korea and Taiwan among the areas involved.

Violence & video games

Jack Thompson doing what Jack Thompson does.

Jack Thompson, American attorney and long time activist against violence in video games has once again drawn an apparently air-tight link between the playing of games and effects on the psyche of our youth. Sparked by the recent shooting at Northern Illinois University that left five dead, Thompson was quick to point out the apparent obsession of the 27 year old shooter with violent video games, chiefly *Counter-Strike*. If every guy in his late 20s that plays video games is a bona-fide axe murderer, then the world is in serious trouble, but Thompson seems comfortable ignoring the huge section of gamers that manage to live out their lives without blowing any (real) people up. Hell, we absolutely live for *Grand Theft Auto* titles, and the only person we feel like pistol-whipping is our esteemed Ed, but that's because he likes it (Hey! *–ed*).

SHORT CIRCUITS

It's nice when the world of gaming can take a leaning towards the educational, and IBM's announcement of a free multiplayer online game called '*PowerUp*', that'll have kids saving a fictional planet from ecological disaster, sends a poignant message about the state of our planet. Aimed squarely at teens and kids, *PowerUp* is designed to be accompanied by classroom lessons associated with the topics in-game. Nice one IBM.

The fact that Panasonic recently spent R&D money designing a plasma television with a protective glass front panel on it is testament to the amount of loonies that – for one reason or another – can't keep hold of their Wii remotes. The increase in people getting a little too Wii-crazy and cracking their television screens with the console controller has led Panasonic to reveal the modified TV set at a product show in Velencia. We're thinking people just shouldn't play *Wii Sports* drunk.

PIPELINE

Requiem: Bloodymare

Early 2008

Apart from the colloquial term for a horse that's been in a bar-fight (because that happens so often) *Bloodymare* also happens to be another exciting on-the-horizon MMO game. What makes this one get the juices flowing? Instead of the now familiar fantasy or sci-fi theme that's draped over most MMO's, *Requiem: Bloodymare* is a horror themed game, featuring a dark future world where the always popular combination of science and magic has let loose nightmares made flesh. As products of science and magic themselves, players are tasked with the job of cleansing the planet. With the Havok engine providing the guts and screenshots online suggesting copious amounts of blood and gore, we're hungry already. Let's just hope it doesn't get slapped with the un-classifiable OFLC stick

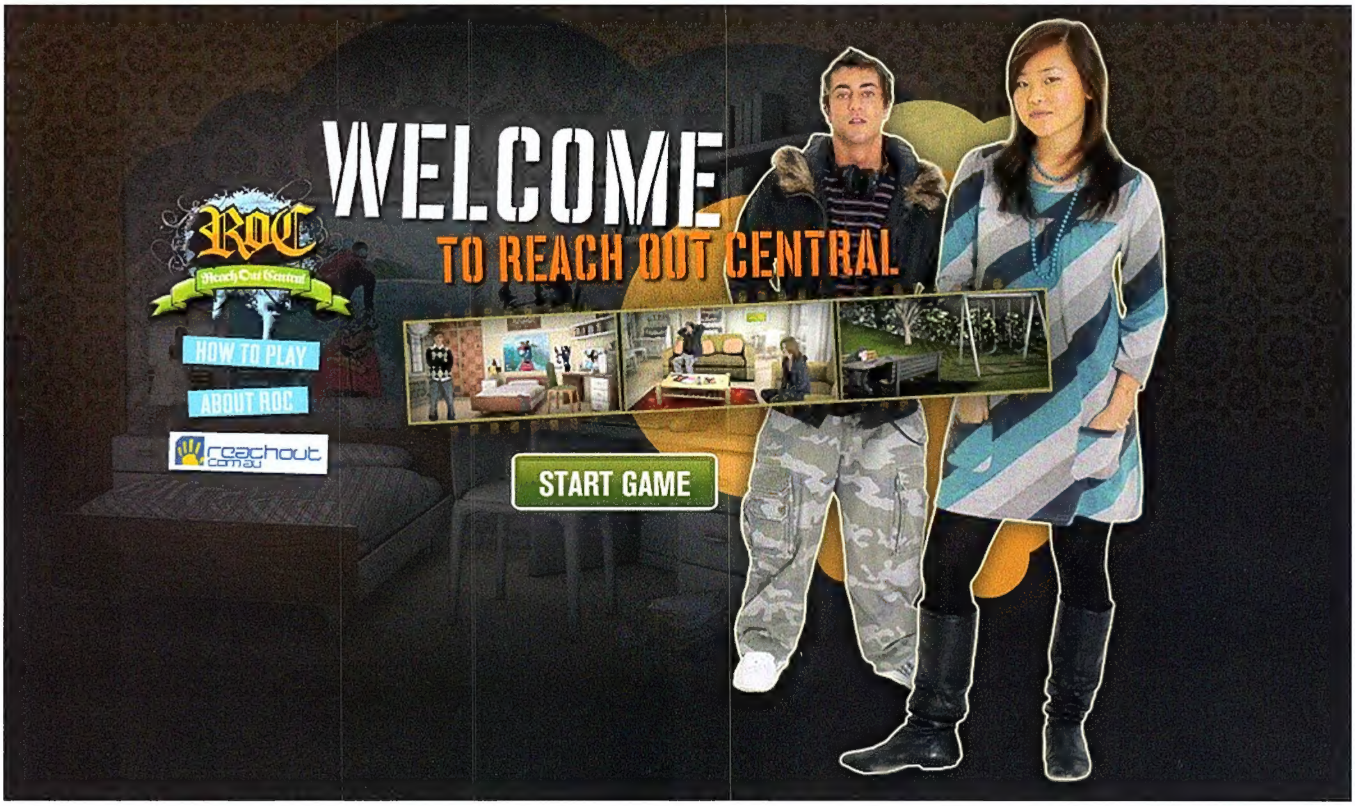
[Platform] PC
[Developer] Gravity Interactive
[Publisher] Gravity Interactive
[Web] www.playrequim.com

Street Fighter IV

Tentative 2008

We were thinking – for the fourth installment of *Street Fighter* – Capcom could change the name to something a little more fitting, like 'the greatest fighting game series ever created', though it's probably a blessing that brevity comes into play. Can you tell we're excited? And why not – the *SF* series is the undisputed top dog of all fighting games, with a rich history, high addiction levels and a lineup of much loved fighters. Yeah, we know it's an arcade release, but expectations are high that *SFIV* will get a showing on next-gen consoles, which is why we can sneak it in here. That – and we just reckon it's a hundred-hand-slap of win.

[Platform] Arcade
[Developer] Capcom
[Publisher] Capcom
[Web] www.streetfighterworld.com



Reach Out

Alexander Gambotto-Burke spends some time with the healing power of games and Jim Batt, the man behind Reach Out Central.

atomic What is the primary goal behind Reach Out Central?

Jim Batt: The aim with ROC was to help young people who might be struggling with depression, anxiety, or other mental health issues they face while growing up. The idea was to use the interactive game medium in a new way to teach or communicate the basic life skills and cognitive therapy techniques that the Inspire foundation has developed. But for the project to succeed, we knew that it was crucial that the game would have to be fun to play in its own right, not just a prop to disguise dry curriculum content, a mistake made by the majority of educational games.

atomic And what is the goal players are trying to achieve when playing?

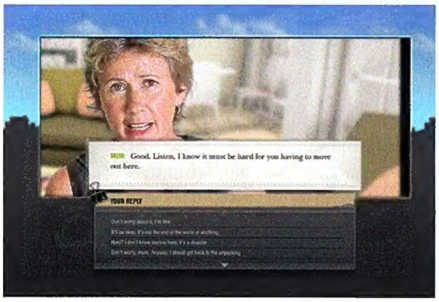
Batt: The game itself is a simple simulation of teen life, with the player playing a character who has just moved, with their mum, to a new neighbourhood. The goal in the game is to make friends and participate in dramatic events as they unfold, while balancing the needs of everyday life and the player characters own mental wellbeing. This emotional side of the character is represented by a Mood Meter system, which forms a key part of the game play. The meter is affected by the way the player negotiates the various scenarios presented in the game, as well as the other activities the player can practice in the game. The idea is that the player navigates the challenges of the game, while trying to maintain a balanced emotional state, this then has an effect on how the player character and other game characters interact.

atomic What practical, real-world benefits does playing the game have? How do you reinforce the lessons taught by the challenges presented in the game?

Batt: The game demonstrates the outcomes of situations a player may find in real life, allowing them to see the possible emotional effects of certain actions or life choices. We basically try to take the lid off and show the player the reasons why people do things, why they might be behaving in a particular why. A big part of the writing was to show the cause and effect relationships behind why you might feel a certain way, or why someone else might be behaving a certain way. How different factors in your life can have an affect on your emotional wellbeing.

So in order to progress in the game, the player follows in-game tips and hints to learn how to modify their character's behaviour to keep a healthy Mood Meter. These skills that the player is learning in order to get better at the game they are playing, are the very same cognitive behavioural techniques that Inspire teaches to improve real-world mental health.

By giving the player an immediate practical application for the knowledge, and providing feedback in the form of in-game success, we create a situation where the information is hopefully retained at much higher rate than just by reading slabs of educational text. The game also links out from situations within the game to appropriate existing web resources developed


MUM: Good. Listen, I know it must be hard for you having to move out here.

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DUAL

Get ready to break some speed records! The latest generation of AMD GPUs has arrived in the form of the world's first on-board dual RV670XT graphic cards - the ASUS EAH3870X2/G/3DHTI/1G and EAH3870X2/G/HTDI/1G. Equipped with the fastest upgraded DRR3 0.8ns memory modules and two exclusive extra DVI outputs, the EAH3870X2/G/3DHTI/1G doesn't hold back in terms of extreme graphical performance. This powerful graphics card also comes with specially designed dual fansinks for both GPUs - enabling efficient heat dissipation. What's more, the ASUS EAH3870X2 Series also comes with the hottest DX10 game, Company of Heroes: Opposing Fronts.

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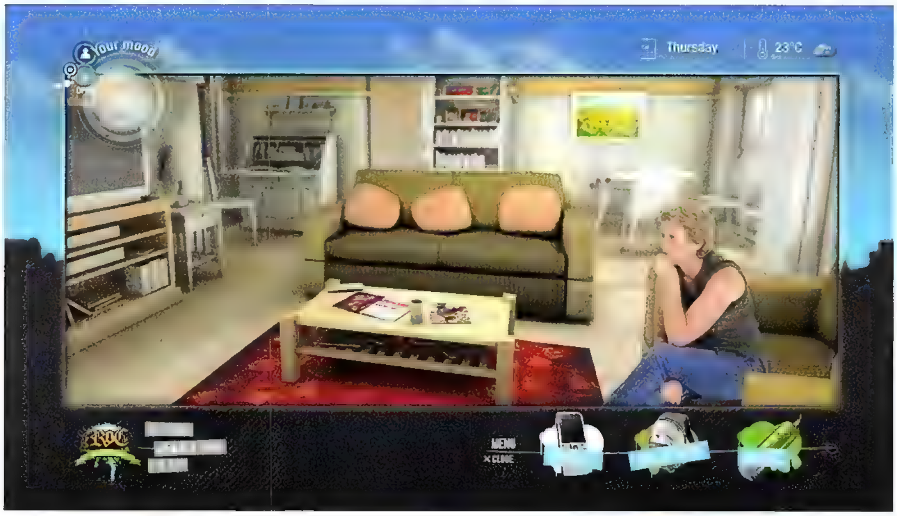
Ultra-realistic Gaming with Company of Heroes: Opposing Fronts

The second chapter in the highest-rated strategy franchise - Company of Heroes: Opposing Fronts, delivers an exceedingly high level of gaming realism with enhanced lighting effects, mission persistence, improved vehicle and soldier AI, enhanced physics and a dynamic weather system. Be amazed at the full graphical splendor that the game can offer only with the powerful performance of the ASUS EAH3870X2 Series today!

by Inspire, allowing players to follow up with further reading if they want to find more in-depth information on the topic. People can learn insanely complex things, whether it's button combinations or arcane puzzle solutions, in order to get a better score or finish the level in their favourite game. We wanted to harness that, and use it to teach skills that had a real world application as well.



atomic In what way does presenting these ideas through a videogame uniquely benefit them?
Batt: Teaching these ideas through a videogame has numerous advantages, one of which is that it allows us to reach a different demographic, for example young guys, who are a traditionally hard to reach group with regards to mental health. Early usage statistics are showing that ROC is reaching a significantly higher percentage of young guys than this type of material usually would. Using the interactive medium also allows people to experiment and have fun, making the information more accessible than heavy slabs of educational text or lengthy non-interactive video tutorials.

atomic How did you go about designing the setting? Was it important that any teenager be able to identify with it?
Batt: In the writing we put a lot of effort into developing a world and extensive back-story for all the characters, to make sure that the game would feel like something that most young people could relate to, while still providing an engaging and dramatic narrative that both explores the relevant issues and hooks the player into coming back to see what happens next.

> “Anything that gives computer games the opportunity to develop more diversity is good...”

atomic What technology is behind the game?
Batt: The game is in the tradition of classic point and click adventure games, but updated with a modern design aesthetic and delivered over the web with flash. Visually it is built from a collage of photographic elements, flash animation, and rendered 3d backgrounds. The whole thing is built with a CMS backend to allow ongoing development of the project.

atomic What are the consequences in the game of behaving in an unproductive/self-destructive fashion?
Batt: Much as in real life, this usually results in negative social responses. People will be hurt, angry or just short with the player. This can make it harder to complete in-game objectives or cycle back into the Mood Meter, negatively adjusting the player character's own emotions. However 'self-destructive' behaviour in games is a fairly natural thing and such experimentation still gives the player feedback on how these things work in real life. The advantage of it being a game is that after learning the lesson they can retry the scenario with more positive behaviour.

atomic What are the benefits of multiple playthroughs?
Batt: It allows the player to try different paths and responses, to explore how changes in their own behaviour can affect other people. It creates a situation where the player can go back and try applying some the things they've learnt while playing the game.

atomic Do you think videogames on the whole should cover this material more often? Do you foresee something like this on a mainstream level?
Batt: In my opinion computer games have a lot of potential that they just aren't living up to. The current game industry is hugely traditionalist. Driven by profit, the rising cost of development in Triple-A quality games for next-gen consoles has the publishers running scared. As the risks become greater, the industry becomes more conservative, resulting in a slew of sequels, overwhelming focus on tried and true game mechanics and narratives. This doesn't leave much room for the medium to grow and develop in new directions. Inspire isn't driven by financial profit margins, and the fact that it has other motivations behind making games puts it in a very unique position. Anything that gives computer games the opportunity to develop more diversity is good as far as I'm concerned.

atomic What has the response been to the game so far?
Batt: The response to the game has been overwhelmingly positive, both critically and from the actual players. To read even one message on the forums about how playing the game helped someone get their life together is hugely rewarding, and validates the project in my opinion. The game has already won an award in the US, and been nominated for others.

atomic Are you planning to change/adapt it as time goes on?
Batt: There are grand plans to keep working on ROC, to both expand the gameplay and continue the storylines established in the first installment. Stay tuned!

atomic The game obviously accesses the game-playing youth demographic, but do you think videogames as a whole can have adverse affects on that group?
Batt: Computer games are no different to any other medium. Films, magazines, books – it's all about the content, not the format. Anything that becomes an obsessively large part of anyone's life can have 'adverse affects', but this is in no way unique to computer games. They are just the current scapegoat, because they are new and unknown. When the novel became popular in the eighteenth century they were decried as the downfall of civilized society. Now we have school programs devoted to encouraging kids to read them. That's what makes ROC interesting. Inspire are part of a growing group of developers who are interested in looking past the current preconceptions about games, to see what other constructive purposes the medium can be used for.

If you're curious to have a look at Reach Out Central, you can find it at **http://roc.reachout.com.au/**

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DELM5560/Q1/WK6/ATOMIC

RAID theory

Ashton Mills puts on his white scientist's coat and gets all experimental on some hard drives.

These days RAID really should be called Redundant Array of *Expensive* Disks (aka RAED; got net speak?), since it's people like you and I who frequently take already high-performing disks and improve our storage subsystem performance even more by RAIDing two or more of them.

And of course, this means RAID 0 is the favourite among enthusiasts for its focus on performance, not redundancy.

But as with just about everything else to do with technology, there's more to RAID 0 than first meets the eye, and in fact your current array could well be under performing if you haven't build it off the principles of RAID theory, which is precisely what we'll cover here.

Parallelism and workload

RAID is all about parallelism – for every drive you add, you can conceptually increase the performance of a storage subsystem by splitting the workload among multiple drives at once. This can reap performance benefits as in RAID 0, or redundancy benefits as in RAID 1, or a mixture of the two through RAID levels 3 to 7 (not to mention 'tiered' RAIDs, such as 0+1).

But parallelism isn't just about RAID. Having two drives in a system, with files and directories split across them, can deliver performance benefits (ergo why it's often recommended to put the swap file on a separate drive from the OS). Separate spindles, as we'll call it, gives your machine the ability to service multiple I/O requests at once – assuming the files it needs can be found on both drives.

Keeping this in mind, designing a good performance subsystem with RAID is as much about the RAID level and system workload as it is about your storage layout, which we'll get onto a little later.

This leads us to something we'll be mentioning a lot – workload. It's important to remember RAID is not a silver bullet. It won't exponentially increase the performance of your system across the board; it can only increase the performance of certain workloads, and like a sliding scale, as you increase the performance of one workload you decrease the performance of another.

Since the performance of a hard drive is largely defined by its seek times and transfer rate, what you do with your machine will determine how well a hard drive can deliver – a hard drive with a low seek time will perform better at frequent random accesses, the type that occurs when you load Windows or launch an application. And a drive with a high transfer rate will perform better at tasks like loading large files, or streaming video. All hard drives obviously do both of these workloads to varying degrees, but one of the side effects of using RAID is that you magnify these differences, and the effectiveness of an array depends on the type of workload it's going to get. If you build an array designed for throughput, it won't perform as well for seek based workloads – and if this is what your machine does most of the time, you won't see a good return for your investment. In fact, as we'll show, for the wrong workload a RAID array can perform *slower* than a single drive.

Seek vs throughput

To understand how this can be it helps to understand the many factors that can influence an array. From the operating system, file system, and drivers through to RAID level, RAID hardware, and individual drive performance there are many variables at play. You can't control all of them, but you can optimise an array for your particular setup.

Since this is Atomic, we'll be focusing on just RAID 0, but even here there is plenty to explore. We'll also assume you like to use identical makes and models of drives for your arrays, because this is simply the smart thing to do.

As covered above, RAID isn't a one size fits all solution – by nature it can provide excellent performance improvements, providing the array is built with your most common workload in mind. The easiest way to categorise your workload is to look at what you use your PC for.

For example, at the extreme ends the type of workload a system may see are frequent random accesses (which we'll abbreviate as *seek*), and sustained sequential throughput (commonly called *sustained transfer rate*). The latter is often exemplified by a machine that may be used in video editing or streaming – large, contiguous, files. The former is frequently represented by common operating system use – lots of small files being accessed at different times. If you're wondering, games usually fall between the two, something you'll be able to see in the benchmark results to follow.

Many enthusiasts optimise their arrays for raw throughput, putting the benchmarks of programs like ATTO and SiSoft Sandra on a pedestal – but this is a mistake. Inevitably, an array that performs well at throughput doesn't perform as well at frequent random accesses – the workloads that require frequent seeking – which just happens to be the workload of their machines when they're actually using them and not running benchmarks.

To demonstrate this we'll be benchmarking using two high-end drive models – the 10,000 rpm Raptor, and the new 32M cache Seagate 7200.11. The Raptor isn't as fast as the Seagate for throughput, but its 10,000 rpm spindle speed gives it a faster seek time. So which will be better suited to your workloads? And will both perform in RAID-0?

MAXIMUM THROUGHPUT

We focused here on the demanding PCMark05 tests and how they reflect the two scenarios of random access seeks and throughput workloads. And even though these are much more indicative of the performance you can expect over a purely throughput-based benchmark, we know you'd like to see the numbers anyway! So here's the maximum burst and average throughput using HDTach of the Raptors in 1, 2 and 3 drive RAID-0 configuration using our sweet-spot 32k stripe:

1 x Raptor 150 – Burst 136 MB/s, Average 76 MB/s
2 x Raptor 150 – Burst 228 MB/s, Average 150 MB/s
3 x Raptor 150 – Burst 293 MB/s, Average 209 MB/s

Just remember, the only time you'd actually see this performance on the array is running HDTach itself. Said another way, these numbers are only good for measuring the performance of HDTach.

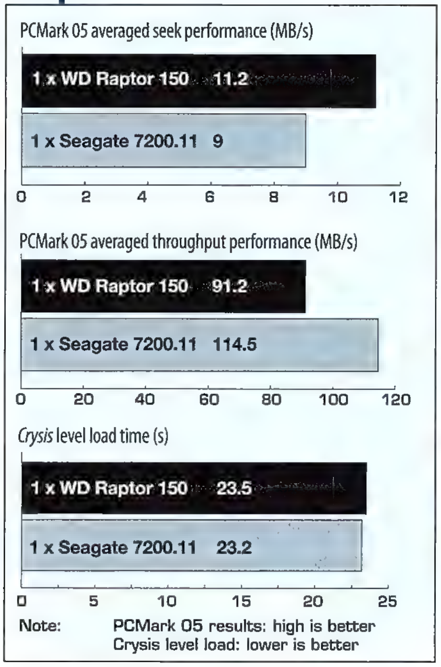
Hardraid vs Softraid

On that note, we have to talk about the RAID hardware component. First and foremost, lets be clear: the onboard RAID controllers that you find on NVIDIA and Intel based motherboards are *not* hardware RAID. Don't be fooled by the fact the feature is provided by a 'chip' on the motherboard – this is little more than disk translation firmware. In truth onboard RAID controllers – often called *FakeRAID* controllers – do all their work in their driver in the OS. In other words, your CPU is the RAID 'hardware'.

Proper hardware RAID controllers are external plug-in cards that utilise their own onboard processors, and sometimes memory as well. They are optimised to manage RAID devices as well to provide for more complex RAID schemes like RAID 5 and above. Yes, many FakeRAID controllers also support RAID 5, but they do it rather poorly and won't give you good performance – if you're determined to use RAID 5, buy a proper hardware solution. For onboard controllers stick to RAID 0, RAID 1, or RAID 0+1.

Of course, external RAID cards are also expensive whereas onboard motherboard RAID is technically free. As always, you get what you

Graph 1



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pay for. Still, while they won't work miracles you can build some pretty beefy arrays with onboard controllers and, more importantly, software RAID.

What's software RAID? Both Windows and Linux come with the capability to build arrays through the OS itself. If you're wondering what the difference is between driver-based FakeRAID controllers and software RAID, seeing as they both use the CPU, the answer is not a lot – although, as we'll also cover later in the benchmarks, they can perform quite differently (see, we think of everything!).

Stripe science

Now onto the meat of this feature – the all important stripe size. Quick primer for those scratching their heads: the stripe size is the size of the data that will be 'striped' across each drive in an array. If you have a 96k file to write on a three drive array with a stripe size of 64k, it will be striped across two drives. If the array used a stripe size of 32k, it would span all three drives. Having files striped across more drives is conducive to better throughput, but this doesn't necessarily translate to better performance – it all comes back to the workload.

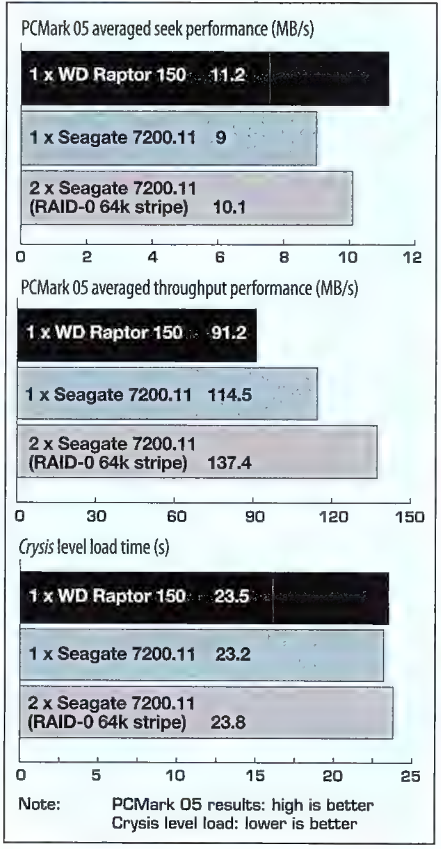
Unfortunately some enthusiasts new to RAID will select the 'recommended' stripe size in their FakeRAID controller, usually 128k. Conventional wisdom states that a stripe size of 128k and above is ideal for large file transfer performance, and indeed this is true – but only because it's assumed the files are so large as to spread across multiple disks with the given stripe size. What actually gives better throughput performance however are lower stripes – the smaller these are the more files that will be striped across the drives, and in *more* stripes (that is – more files spanning across more drives).

Indeed, in terms of seek vs throughput, larger stripes are actually better – why? Because small files will reside on one disk only, freeing up the other disk for the next I/O request. Smart RAID algorithms can use this to parallelise requests across the disks, each serving up separate complete files.

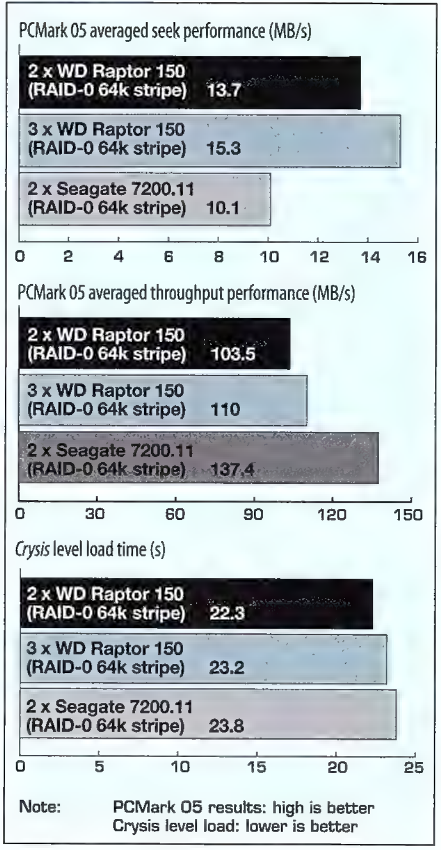
So those of you thinking you'll jump to the low stripe size of 8k or 16k – yes your throughput scores will skyrocket, but your random access scores will plummet. Use a large stripe size of 128k or 256k and you'll ensure great seek performance scores, but your throughput won't be taking full advantage of the striped nature of your array.

This is why a stripe size of 64k is often recommended as the best 'balance'. And, in fact, it does perform very well for both types of workload.

Graph 2



Graph 3



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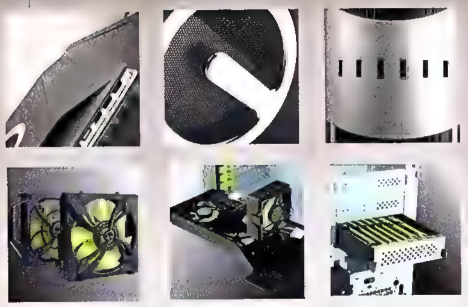

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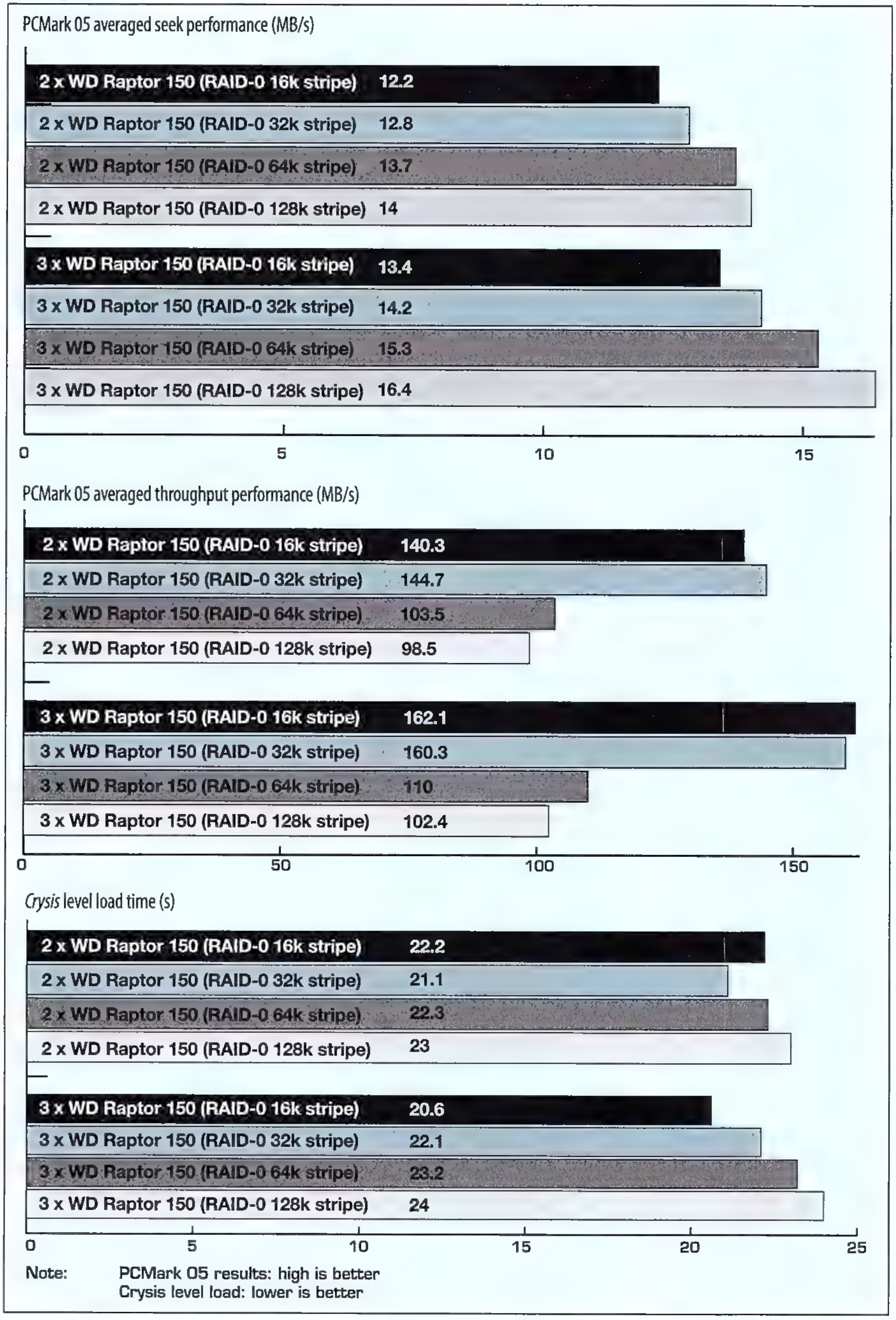
Graph 4



However there's one more factor you need to consider – the number of drives in the array.

If, for example, you set up a four-drive RAID 0 array with a stripe size of 128k, a good chunk of the files on your system will never benefit from being striped, or only be striped across two or three drives. If throughput is your priority, if you're building for video streaming or benchmarking for example, then a good rule of thumb is that the more drives you use, the smaller you need your stripe size to be to ensure files are striped across the drives in the array.

And yes, this means of course there is a ceiling to the effectiveness of drives in a RAID 0 array – you can't keep throwing drives at it and expect to see a linear increase in performance. For this reason, RAID-0 arrays are optimal between two and four drives, but if you go for four drives you might as well use RAID 0+1 and gain both speed and redundancy.

In summary smaller stripe sizes of 32k, 16k, and even 8k can offer greater performance for sustained throughput, but this comes at the cost of seek performance (if this is important to you). Similarly 128k and 256k stripes allow for much greater parallelism of the drives, but throughput can suffer on files that could otherwise be striped.

As a result the accepted norm for a balanced value is 64k – and this is exactly what Windows will use if you create a 'striped' RAID volume. Unfortunately, Windows won't let you change this so it's the only option if you use software RAID.

So that's plenty of theory, let's see how it works in practice. To see just what impact stripe size, array size, seek vs throughput, and software RAID vs FakeRAID all have on performance we did the only thing a sane Atomican can do – we benchmarked to buggery.

Need for speed

Because we can't fill the entire mag with RAID benchmark results (oh I want to, but Dave won't let me! (there, there, pet, there, there *–ed*) we'll break these down into a number of categories, each focusing on the topics we've discussed.

For our tests we used an E8500-based machine on a 780i motherboard that comes with NVIDIA's MediaShield FakeRAID controller. All of the tests were on the NVIDIA controller, unless otherwise indicated. For storage we used a mixture of 10,000 RPM Western Digital Raptor 150 and Seagate's latest 7200.11 32M cache 500G drives – all separate from an OS boot drive. All tests were conducted after cold boots and on empty drives and arrays, and so represent the fastest outer tracks.

Although we benchmarked the drives using PCMark05, SiSoft Sandra, ATTO, HDTach and *Crysis* level loads, the most pertinent benchmarks are PCMark05 and *Crysis*, since these show off the type of workload you're likely to see using your PC for working, web surfing, multimedia, and gaming (don't expect soaring scores here, as real world use looks a lot different to raw throughput benchmarks). The SiSoft Sandra and ATTO results

STRIPES AND CLUSTERS

Just when you thought it couldn't get more complicated – you may have noticed that the default filesystem cluster size for the NTFS filesystem in Windows is 4k. This ensures a good use of space, minimising 'slack space', a term you probably haven't heard since the DOS days. Windows, however, will allow you to format a drive using cluster sizes up to 64k, and some enthusiasts recommend using a cluster size equal to your stripe size for an array. In theory this sounds useful, but you could also argue for cluster sizes less than or greater than the stripe size – a cluster larger than the stripe for example will ensure every single cluster is striped, possibly helping throughput, while a value less than the stripe will ensure a distribution of striped files and whole files good for seeks. Naturally, the truth is in the tasting – so we tested cluster sizes of 8k through to 64k on the RAID 0 Raptors using the sweet spot 32k stripe and, well, it made no difference that couldn't be put down to statistical anomalies. Given you lose space efficiency with higher cluster sizes, there appears to be no advantage in changing from the default 4k, so we recommend exactly that.

were good for showing read/write ceilings, and they generally reflected the individual results seen in PCMark05. HDTach results were good for showing maximum throughput ceilings.

If you've used PCMark05 you'll know it breaks down the hard drive performance benchmarks into a number of usage categories – perfect for our testing to see how RAID arrays – and especially RAID stripe – affect different workloads.

Three of the tests focus on random access and seek-based workloads (OS Loading, Application Loading, and General Use) while the final two focus on throughput (Virus Scanning and File Write). To keep things simple in the graphs we've averaged these results into the categories they represent – seek and throughput. Don't be put off by the seemingly low transfer speeds for the seek workload based results – PCMark05 is deliberately demanding, and this helps separate the men from the girly-men as it were.

Finally, the *Crysis* level load time (based on the GPU_Benchmark level) is a good real world test of array performance for a level-loading, gaming workload as distinct from operating system, application and throughput workloads in PCMark05.

First up, let's establish baseline performance – single drive Raptor 150 and Seagate 7200.11 in Graph 1.

As expected the Raptor has a good lead on the access-based workloads, showing off the advantage of its 10,000 rpm spindle speed. At the same time the Seagate 7200.11 has some serious throughput power, pumping over 100MB/s all on its own and outperforming the Raptor. Now let's answer the question of which is more important to your everyday workload and gaming, seek or throughput? Let's RAID the Seagate drives and see in Graph 2.

As we can see, even though two of the beefy Seagate 7200.11 drives in RAID provide an even higher throughput score, they still fall behind a single Raptor for everyday use workloads, and they actually load the *Crysis* level a little *slower*. Not anything you'd notice, but it's certainly not as fast as you might expect a RAID 0 array to provide. This is why it's important to build an array to your workload, or you might not gain much at all.

On that note this graph also shows the importance of choosing a good stripe size – the 'balanced' 64k stripe here isn't helping the Seagates, and as we'll cover in a moment a smaller stripe would yield better performance for throughput. Still, you can take this away: for general everyday workloads a single 150G 10,000 rpm Raptor is faster than two 500G 7200 rpm Seagates in RAID 0.Even though the Seagate's density and large cache outperform the Raptor for sheer throughput, the Raptor's RPM gives it the edge for general PC use.

So what happens if we RAID the Raptor, combining its fast seek capabilities with higher throughput in RAID? See Graph 3.

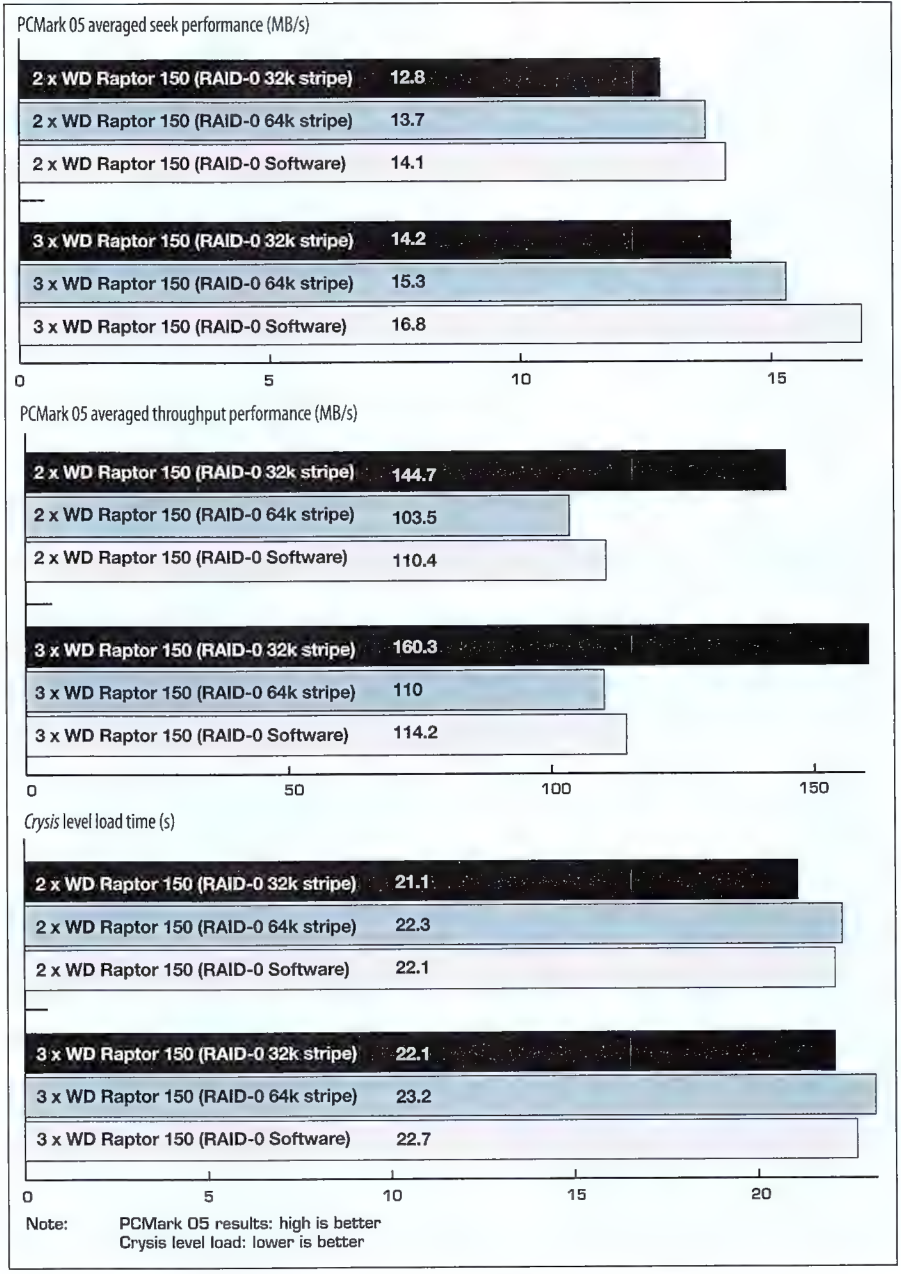
Nice, really nice. We see the RAID Raptors pulling away great scores for the seek-based workload, and the two-drive Seagate RAID still outperforming three Raptors in the throughput-based workload. But now we see something interesting – firstly note how the seek-based strength of the Raptors provides a slightly faster level load over the Seagates, indicating random access is an important factor for the level loads. Also note how the level takes *longer* to load on a three drive array compared to two drive. Let's see how different stripes perform for two and three drive Raptor arrays in Graph 4.

Here we see the exact impact stripe size has on seek and throughput-based workloads – as the stripe size increases the seek performance increases while the throughput decreases. In the throughput scores we can see a sweet spot – 16k and 32k stripes provide a much higher throughput compared to 64k and 128k. The drop isn't linear, and if you look closely you'll see it's inversely represented in the seek scores. This gap could be a function of the NVIDIA controller and drivers, but also of the specific files and file size workload PCMark05 is performing here. Which is why it's handy too look at the *Crysis* result as well – as in the previous graph we see two drives performing better than three at the large stripe sizes, but the reverse is true for the small stripe sizes. The three drive 16k stripe gets the fastest score of all, revealing that for Crysis, at least, throughput is as important as seek performance.

We've got one more combination to try – software RAID, and Graph 5.

Well, that's pretty clear – Windows software RAID owns the onboard RAID for the same stripe size for both the seek and throughput workload scores, a result that's reflected in a faster *Crysis* level load score as well.

Graph 5



Note: PCMark 05 results: high is better
Crysis level load: lower is better

All said and done

There are a number of conclusions to draw from our foray into RAID. First and foremost – a RAID is only as good as the workload it's designed to run. If you're building an array for high benchmark scores, you're shooting yourself in the foot for everyday usage. Look at what you want to do with your machine, and build the array to match.

Next, stripe size is your key to tailoring the array to a seek-based or throughput-based workload. Note that every day usage errs on the side of seek, video editing or similar roles err on the side of throughput, and games generally need a little of both.

Speaking of which, for *Crysis* at least, RAID does bugger all – Oh there's a performance increase to be had, at best we shaved three seconds off the level load with a three drive array and a 16k stripe, but that's not much in the grand scheme of your gameplay. You certainly wouldn't build an array just for this.

> **“You can build some pretty beefy arrays with onboard controllers...”**

For our particular setup, using the onboard NVIDIA controller and Raptor drives, a stripe size of 32k is the sweet spot – but the lesson here is that every machine is different. When you build an array, it's well worth your time to test the various stripes to see what works best on your configuration, for your workload.

Finally, software RAID outperforms FakeRAID. That said it's not as simple a choice to disable your RAID BIOS and go all out on software RAID; it's worth looking at the pros and cons of each.

For example while software RAID performs better, under Windows at least you can't choose your stripe size (you can under Linux, but we haven't covered Linux benchmarks here – and yes, we did test some too using Bonnie – as we didn't have the space).

Next, because software RAID works across partitions, not drives, it's more flexible than FakeRAID – you can mix and match stripe, mirror, and JBOD (Just a Bunch of Disks) spanned RAIDs across both Windows and Linux as you wish (something Intel calls 'Matrix Raid' – nothing new under the sun). And if your drives move to a new machine, they are simply drives with RAIDed partitions and you'll be able to read data with ease. FakeRAID, on the other hand, is tied to the particular controller, so moving may be harder.

In favour of FakeRAID, however, is that you can install Windows to it as a boot drive, something you can't do if you're using Windows software RAID. However, we have a workaround for this which we'll get onto next.

These are all the issues worth considering when it comes to building your array – and you thought we were going to *tell* you what to do.

Oh, ok then, try this.

A recommended setup

Let's say you have four drives ready and waiting to go into a RAID 0 array, *just because you can*. You could build a four drive RAID-0 array for Windows, your data, and games but this doesn't really take advantage of parallel I/O. Using RAID 1 would, but you don't care for redundancy, do you? That's what backups are for, afterall.

Instead, you could do this: create two two-drive RAID 0 arrays and install Windows on one, and your games and data on the other. You'd be smart and test the arrays as two-drive entities to find the best stripe size for your particular setup. And then once Windows was installed, we'd recommend you do the following: move Program Files to the data array, so that Windows is spread across the two arrays, taking advantage of both striping and (effectively) separate spindles.

This trick works whether you use one, two, three or four drives in a system, in whatever manner you wish to keep drives separate or build arrays.

First copy the entirety of your 'C:\Program Files' (and if using x64, 'Program Files (x86)') to your data array. Rock back and forth in your chair mumbling something about jelly while you wait. Then fire up Regedit and search for 'ProgramFiles' as a Value. When it pops up, edit it and change the path from 'C:\' to whatever drive letter you moved it to. Do the same for the 'Common Files' value on the same page and, again if you use 64-bit, the (x86) paths as well. Continue to search, and replace all instances.

Don't have four drives? No worries; even if you have a system with a single Windows boot drive and an array for data, you can still boost Windows performance by moving Program Files across. This would reap better performance than a single three drive array acting as a Windows boot.

Next time we cover RAID it'll likely be using multiple solid state drives, and at that time we'll be recommending a change of undies as well as good theory behind the building of an array.

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ARMY. CHALLENGE YOURSELF.

Pixels in motion

James Matson rounds up 3D artists, developers, and an extra large popcorn as Atomic lifts the lid on the world of cinematics for games.

Storylines and narrative are commonplace in modern games; epic tales accompany on-screen action to explain why we're planting C4 on walls, mowing people down with Flak-Cannons or hunting for the crystal/child of prophecy that'll save the world. Again.

Before PC and console platforms had the power to flex multimedia muscle, static bitmaps strung together from a limited palette and complimented by text dialog were the best devices around for getting the story across to the player. It seemed enough at the time to draw us into 16-bit greats like *Shadow of the Beast*, and the 90s stint of FMV (Full Motion Video) footage in games (starring actors best left to bootleg porn films) was quaint for a while, but in a world where Shader Model 3.0 can spit out luxury real-time 3D, cinematics have had to evolve to stay fresh.

Now games are preceded by incredible trailers. Cut-scenes between levels are emotive moving works of art, shaping our understanding of the in-game world. For this level of visual splendor, the tool of choice is often offline 3D rendering, allowing unlimited creativity. Game developers like Auran don't have the in-house capabilities to produce the kind of heavy duty 3D found in most game cinematics; instead outsourcing the work to a dedicated studio like Act3 animation in Melbourne to produce the trailer for its fantasy based Player-Versus-Player MMO, *Fury*.

"The trailer was something we don't have the rendering power to do time-effectively in-house," explained Bjorn Bednarek (associate producer, Auran).

"It made more sense for our team to work closely with Act3 producing a trailer that reflected the artistic direction of our team, using the talent and hardware of a specialist company."

To get the meat of how in-game movies are made we decided harassment of everyone from Act3 to NVIDIA was the best course of action.

Final Fantasy, a game inexcusably [illegible] with beautiful CGI sequences.

Sketchy beginnings & art by proxy

Often artists will meet with game developers and spend time getting an understanding of the aim of the cut-scenes or trailer, pouring over concept art storylines and even the engine itself, taking note of anything that gives a strong indication of art direction and theme. From this, concept drawings are whipped up and placed into a 'storyboard' – a collection of rough sketches highlighting major points in the rendered film. These storyboards aren't the kind of stuff you could stick glass over and hang in your lounge room; we're talking extremely basic stick figures in a cartoon style, just enough to give an impression back to the client of where the artists think the clip should head. Nothing is in three dimensions yet, just loose ideas; the beginning of the road.

When CGI first leaps off paper and onto the screen it's using 'proxy' objects, crude models of the final work. This phase is about extending the rough storyboard into the 3D world, but is still bereft of any detail. While the opening sequence of the *Fury* trailer might be a toned and supple female warrior running between towering ancient pillars, the proxy scene will be a coarsely rendered human figure, without textures, mapping or animation, 'floating' on a path through a mock environment.

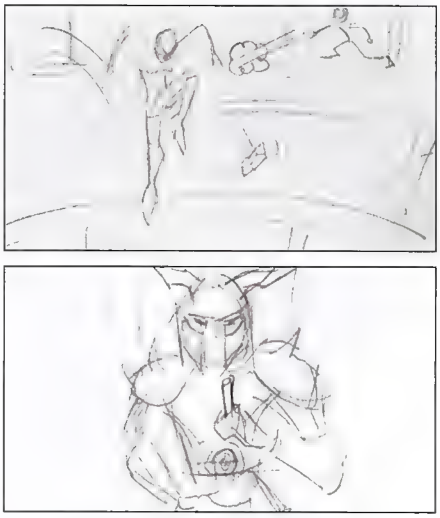
The artists at Act3 perform even this elementary work on PCs that could eat a high end gaming rig for breakfast and still have room for pancakes. Each work system houses a monster Core 2 QX6850, Geforce 8800Ultra 768MB GPU and a whopping 8GB of PC-6400 RAM, all designed to fuel 3D Studio Max for modeling/rendering. Just try and tell us they don't play *Crysis* after work.

Proxy animations and models afford artists the chance to play with camera angles, shot layouts and re-render scenes using a minimum of processing power and – more importantly – time. Without complex textures, lighting and special effects, the entire CGI sequence can be manipulated and re-rendered in a fraction of the time it would take the final production.

Show us your assets

Once the studio and the client agree on the proxy work, artists begin modeling the high quality objects, environments and characters for the final render. These are the 'assets', the guts of the production. While game developers and CGI studios both churn out initially complex 3D objects reaching into the millions of polygons, only the CGI team has the luxury of keeping these for the final animation. Game developers use techniques like normal mapping (where detail is taken from a high poly model, put into a normal map, then applied to a much lower detail model like a standard texture) to give the appearance of quality in models while avoiding a pixel hernia in the game engine.

"A lot of in-game assets start off as high-poly source models," explains Tom Drew, senior artist on *Fury*. "They're used to help render out textures, and are baked down into multiple low poly textures."



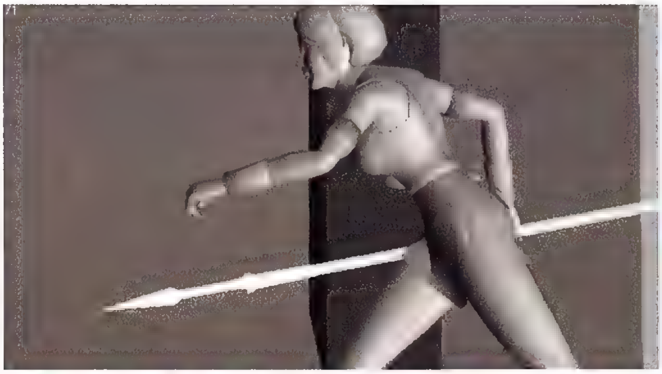
Concept sketches that end up as sexy 3D art.

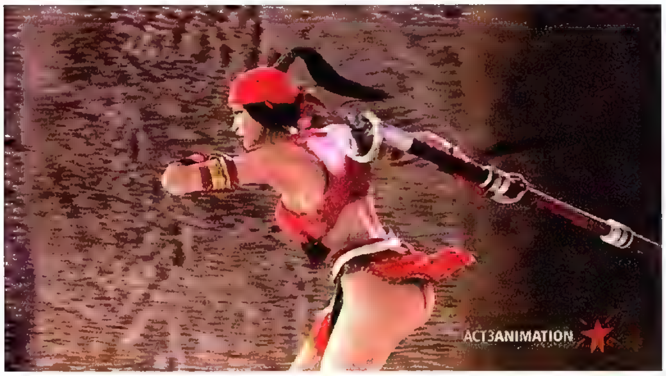
THE HARDWARE

Act3 has plenty of processing power but time constraints can lead the company to seek out bigger render farms to get the job done quickly. 'The Green Machine' supercomputer at Swinburne University Astrophysics & Supercomputing department in Victoria provides a monstrosity of a setup to chew through CGI. Liaising with Russell Scott (part of the Swinburne faculty and himself a 3D artist for educational short films about space and physics) Act3 on occasion outsources rendering work to Swinburne's resident uber box. The tech specs speak for themselves…

Render Farm	Nodes	CPU (per node)	Memory (per node)	Storage (per node)	Operating System
Digic Pictures	34 (Mixed SBXL52 & SR1530CL blades)	Dual CPU Intel Xeon 3.2GHz	4GB	160GB	Windows
Act3 Animation	12 (Dell SC1425 blades)	Intel Xeon 5355 Quad-Core 2.66GHz	16GB	160GB	Windows
The Green Machine	145 (Dell 1950 blades)	Dual CPU Xeon 5138 Quad-Core 2.33GHz	16GB	2 x 500GB	Linux (CentOS 5)

While primarily used for generating scientific models of spiral galaxies and dark matter, the Green Machine supercomputer occasionally chews through cinematic 3D.





Proxy versus the finished product.

Gerard Roche, production manager at Act3, sees a tangible benefit in both industries working with detailed 3D models in the beginning, "Normally for in-game characters a games company will create high resolution characters then lower the res until they have the optimal model for in-game. If we're lucky we can get our hands on the original model, saving us a bit of time. Usually we'll receive models between 8K-15K polygons. Our final models will end up anywhere from 100K-200K. With offline rendering we can have heavy poly count models, apply a wider range of effects and composite over the top that can't be done real time as it's too heavy on the hardware."

While plenty of creative spark goes into the modeling and texturing, it's only half of the visual workload. The other half is animation. As far as techniques go, there are two main methods for animating objects in 3D space, the more traditional of which is 'Keyframing'. Imagine you want to animate a ball rolling along a floor as part of a 1000 frame sequence. Rather than manually moving the ball a fraction in each single frame, Keyframing allows the artist to put the ball at the start of its journey in frame 1, the end of its journey at frame 1000, and the software will calculate all the movement in between. While that's tidy for some sequences, what about more complex stuff like the human form? That's where Motion Capture (or 'mocap') comes into play. Using small reflective spheres placed at strategic points on a live actor's body, mocap relies on special cameras placed around the actor that pick up the coordinates of each sphere as the subject

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Random lunatics impersonating Christmas trees, or motion capture? You decide.

With mocap applied, detail seeps into the *Fury* trailer.

moves, and translates them into animation data, which is then applied to the 3D model.

The power of mocap lies in the creation of a heightened sense of reality in animation, directly copying real movement down to the sub-millimeter level. For the *Fury* trailer, Act3 used motion capture for the major movements of two characters fighting, and blended in Keyframing for the facial expressions and hand gestures.

The final fantasy

With the world modeled and animation rigged for characters and objects, the heavy-duty work towards a final render begins. Rather than operate on a complete scene, CGI studios store scenes in 'layers', each one representing certain 3D elements like models or particle effects. Varga Tamas, artist at Digic-Pictures and part of the team behind the *Warhammer: Mark of Chaos* trailer elaborates:

"A typical shot gets decomposed into several layers, which are re-assembled in a 2D compositing package. This way we can devote all processing power to rendering particular elements, allowing flexibility in editing without re-rendering an entire scene."

Gerard from Act3 concurs. "We have separate shadow, diffuse, occlusion and reflection filter passes for the geometry and textures. On top of that maybe another 15 to 20 FX passes comprising of fog, smoke, blood and so on."

Act3 use a combination of VRay Render Elements and RPM Manager software to arrange layers; the scenes will then be processed on their in-house render farm. 'Backburner' – a part of the 3D Studio Max suite of software – looks after distribution of frames for rendering over the various networked servers and each separate machine works on its own frame, one at a time. The render times can vary between a few seconds to a few hours per frame depending on the complexity of the scene, with a single second in a typical cinematic sequence comprised of 50 to 100 different rendered layers.

"If you have lots of geometry with hair and cloth simulation it's a heavy render," says Gerard. "Particle effects, like fire, also take time."

Time is – at every stage during the development process – the most critical factor. Everything from the way scenes are handled to the careful selection of rendering hardware is designed to make sure maximum quality can be achieved in the minimum render time. In that respect at least, the balancing act in offline rendering is no different from real-time, only that CGI studios have more hardware to play with.

Once rendering is complete, and the footage receives art and technical sign-off, audio and music is synced in,

"Audio is one of the last things we do" says

WE ALL SCREAM FOR... GELATO?

The bridge between human talent and the hardware comes in the form of 3D rendering software. While 3D Studio Max (and to a lesser extend Maya 3D) forms the bulk of the industry standard, NVIDIA has been busy cooking up an alternative renderer – called 'Gelato' – which is primed to find a home on the hard drives of CGI studios. We caught up with Larry Gritz, senior developer of Gelato for some Q&A.

atomic In the development cycle of film or game CGI, where does Gelato fit in?

Larry: Gelato generates final production renders for film or other high-quality animation. It also has a mode where it can be used for rapid previews of lighting, where for a single frame, changes to just the lights can be re-rendered more rapidly than doing a full render. For coming releases, we're also working on a truly interactive mode, where shadowed lights can be moved or altered with image updates taking no more than a second, at nearly final quality.

atomic Is Gelato complimentary or competitive to other programs like 3D Studio Max?

Larry: Complimentary. Maya and 3DSMax are full suites of modeling, animation, effects and rendering. Gelato isn't meant to take their place, but be an add-on that replaces those suites' rendering components, creating more complex scenes at a higher quality than the built-in renderers of the well known packages.

atomic NVIDIA touts Gelato as having the capability to leverage the NVIDIA GPU as a floating point math processor; can you explain?

Larry: Gelato is not a real-time application that draws images to a live screen; instead it's a computational application and relies in part on NVIDIA GPUs for math calculations in rendering, along with the CPU. To the best of our knowledge

Gelato is the only renderer on the market that leverages the GPU for 'final frame' calculation.

atomic Where has Gelato been used in the industry?

Larry: Recently completed or in-progress films that use Gelato include 'Journey 3D' (effects by Frantic Films) and 'Resident Evil 3' (effects by Anbirain Digital). NVIDIA also completed its first animated short film 'The Plush Life' which highlights the rendering features of Gelato.

Gerard, "we send the final video sequence along with a brief of the types of sounds required to a dedicated audio studio and they appropriate sounds for us. We'll sit down with them and make sure we get something that matches the feel of our film. It's the same process for music; we usually hire a composer to create something original."

The length of footage seen in the end production doesn't really do justice to the time and effort expended. To put things in perspective, after all the blood, sweat and tears put into the production of the *Fury* and *Neverwinter Nights 2* trailers (both Act3 creations) it took over month to render out the one and a half minutes of footage for each of them, separately.

The final piece, after the arduous journey through concept art, modeling, texturing and animation is breathtaking. Cutting edge real-time engines like CryENGINE and Unreal3 still can't hold a candle to pre-rendered animation in terms of complexity and detail. But the real question begging to be asked is for how long will that be the case? When will real-time software and hardware be powerful enough to do away with offline rendering for good, instead utilising in-game footage to produce cut-scenes and cinematics? Larry Gritz, NVIDIA developer and ex Pixar technical director thinks there's still plenty of life in CGI.

"Games lag about five to ten years behind film, in terms of look, quality, and complexity. I don't see that changing soon simply because games must render each frame in 1/30 or 1/60 of a second and will settle for whatever quality fits into that time constraint. Offline rendering can set a quality limit and take as much time as necessary to hit it. So I think within a few years games will be routinely using basic ray tracing and global illumination (as film has been doing for five plus years), but by then film will have moved on to even more advanced techniques, or be using those global effects on scenes that are much more complex."

Whatever's on the evolutionary horizon for game cinematics, there's no easy way to impart the amount of dedication, talent and pure imagination that goes into the production of those few precious minutes of CGI eye candy. If you've never really stopped and paid attention to some of the beautiful pre-rendered 3D woven into today's games, take some time out and do it. *Hellgate: London* (despite being an average game) has an intro movie made of pure digital sex, so there's a good place to start. Like us, you won't be disappointed.

ACT3ANIMATION

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After all the person hours and heavy processing, the final *Fury* cinematic is born, horns and all.

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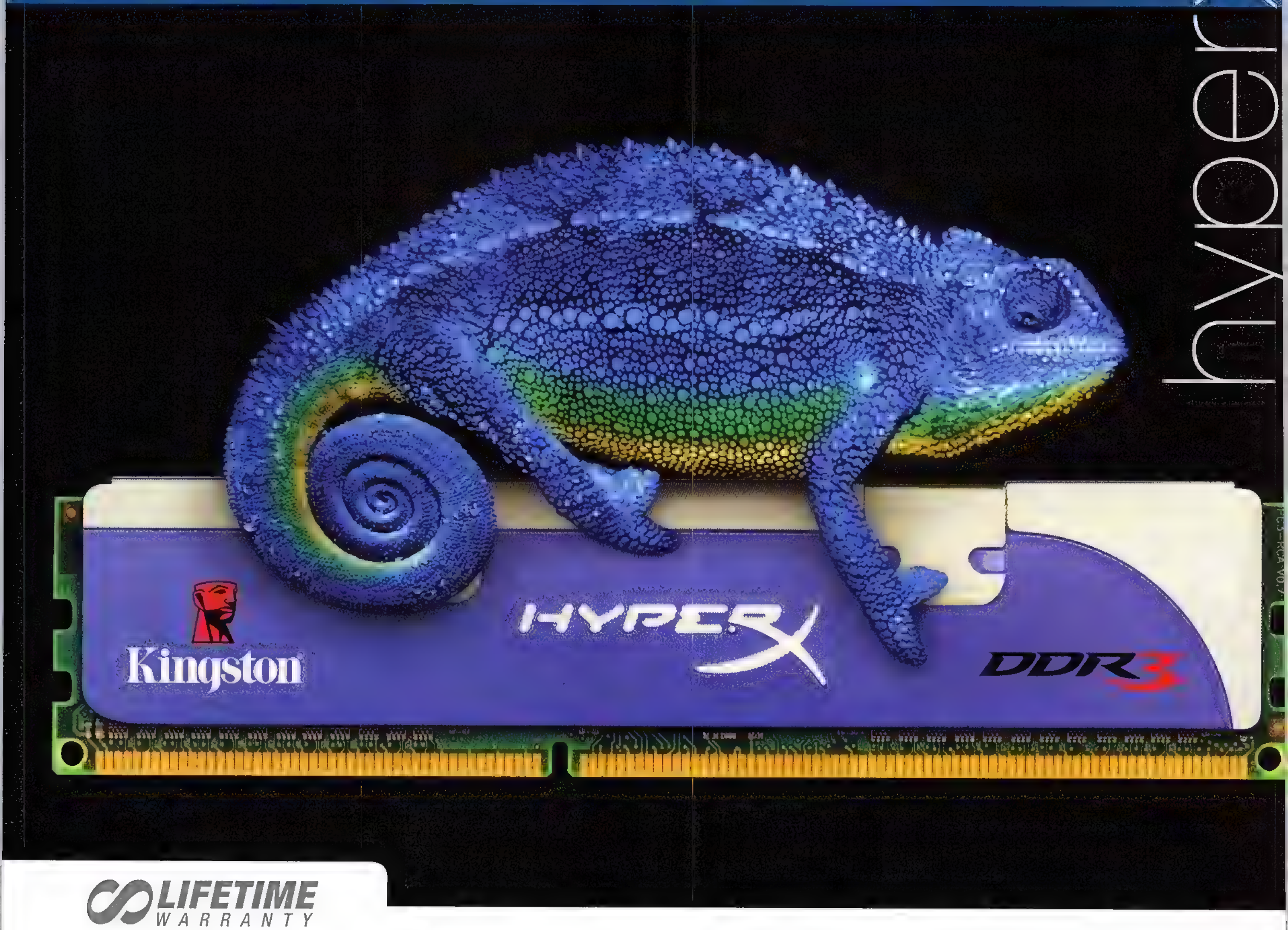

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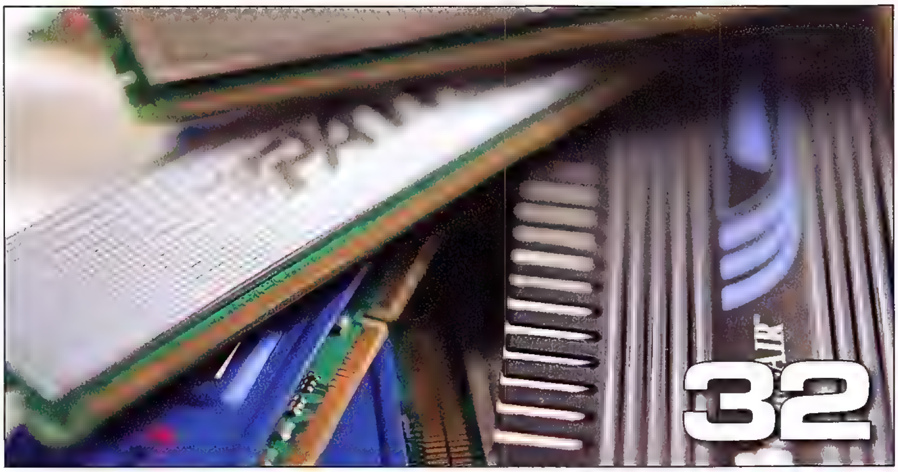
NEWS, REVIEWS AND ROUNDUPS ON THE LATEST HARDWARE

Hot damn, but the tech just keeps coming…

This issue we get up close and personal with brand-spanking new mobo from XFX, and the lastest chip from Intel. Then it's cards, cards, cards as we round up a host of NIVIDIA and ATI graphics toys, including our first look at NVIDIA's 9-series – the 9600GT, which offers hella performance for a mid-range card.

We've also got two pair of gaming laptops and PC cases, so it really is a little something for everyone this month.

But what we're really excited about is our roundup of DDR3 memory kits – we put a range of enthusiast and mid range 2GB kits to the test, finding the sheer powerhouses and the budget must-haves. Seven kits tested, don't miss out.



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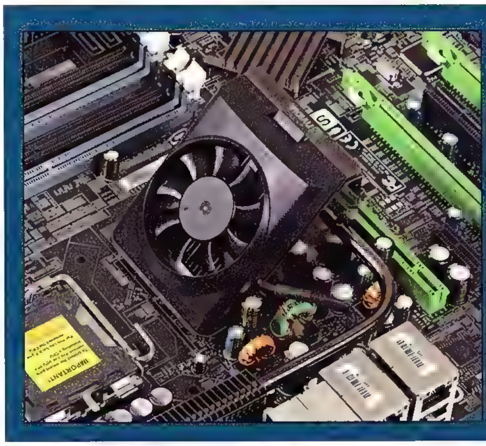

Win a great XFX nForce 780i 3-way SLI enabled motherboard!

XFX and Atomic are chuffed to offer one of our lucky readers the chance to really get into some high end gaming, with this excellent start – the latest chipset, more card slots than God, and it all looks great to boot!
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Aurvana Live! Headphones

Price $249.95 **Website** www.au.creative.com

Music is one of the constant elements of life at Atomic HQ. It rattles around the componentry arrayed around our labs, blasts out of the speakers in our corner of the office – alerting all and sundry that deadline's getting closer as the music gets louder – and when we need some personal space to indulge the written word, we turn to our headphones.

Creative's Aurvana Live! Headphones provide a particularly great way to shut out the distractions of the gross physical world in lieu of a more spiritual place. Featuring super fine acoustic tuning and driver technologies, these Aurvana cans offer excellent playback of music and games, while powerful 40mm Neodymium magnets drive clear highs and lovingly large bass tones. And, being one of those nice, full-enclosure designs, means ears on the generous side won't end up quite so achey. Cheers, big-ears!

Mana Energy Potion

Price 20 silver pieces **Website** www.manapotions.com

Now here's a beautiful, dare we say it, synergy of form, function and marketing brains. The little potion bottle (form) evokes magic realms, chests full of treasure, and adventure. The drink itself (function) is kinda sweet and sour, but who cares what it tastes like when it delivers 160mg of caffeine into your system? And it's a Mana Potion! What rabid World of Warcraft fan (marketing) wouldn't want to have every slot in their inventory (fridge door) filled with one of these?

Now, before you get too excited, the company behind these wonderful drinks does not yet ship worldwide – but it's coming! In the meantime, however, you can enjoy their various images and videos of a catapult they made from an industrial robot arm. No, we have no idea what that has to do with Mana drinks either, but you can't argue with a bowling ball smashing through a recreational vehicle.

Creative Zen 2GB Media Player

Price $149 **Website** www.au.creative.com

The general march of tech towards tinier and tinier form factors is all well and good, but where does it end? A portable hard drive that doubles as a tongue stud? How about a USB drive you can get injected under a finger nail? Thing is, if things get much smaller, we'll need them permanently attached just to stop ourselves from losing our prized tech toys behind the couch, along with smarties, five cent coins and small mysterious bags of powdered sugar.

The Creative Zen 2GB falls just short of this size conundrum. Roughly the size of a credit card across its face, it sits neatly in the palm of your hand, looking all shiny and nice. It also boasts a 2.5in LCD, which, again, is about the limit of how small you want such things to be. Despite the tinyness of this player, Creative has gone to great length to make the Zen's interface as easy to follow as possible; the results are good, and navigating from music to movies and back again is easy as pie. Or Pi, if you're particularly clever.

Finally, the new Zen features an expandable SD memory card slot, allowing users to boost storage and swap files with ease.

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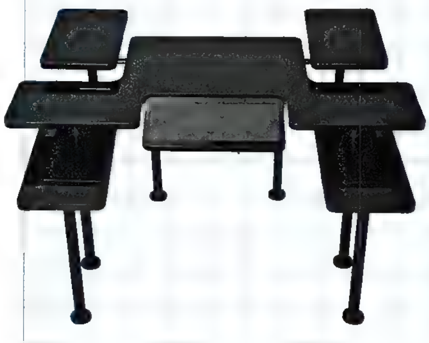

Roccaforte Ultimate PC Desk & Workstation

Price $725 **Website** www.primelogic.com.au

A good desk is the foundation of your computing experience, yet, oddly, many people – and we're not excluding ourselves – make do with rickety boards mounted on cinderblocks, or similarly makeshift construction that threaten our beloved machines with floor-crashy doom at the merest budge or bump.

Not any more! Assuming you're happy to part with a sizable sum – though we do think it's worth it – you can score yourself this Ultimate PC Desk! Layered and stepped like some Mayan temple dedicated to the God of gaming (I call him Gamezor –*ed*), the Ultimate PC Desk has a place for every kind of computing peripheral, and can be used to create every kind of gaming setup. FPS fanboy? Then your extra, finger-shattering control pads can sit on their own pedestal. Flight-sim nut? Clip on joy-sticks, throttles and Snoopy toys can be positioned to your heart's content. Even for just plain everyday use, the convenience and ease of management this desk offers is simply tops. Yes, we said 'tops'.

iPod Touch 32GB

Price $629 Website www.apple.com.au

We won't kid you. There are certainly much cheaper media players out there. There also might be better connectivity options out there, and smaller ones, too. There even are units that can combine all the functions of the Touch, and throw in greater storage capacity.

But there are few things that look and feel quite so cool.

The latest iPod Touch, like so many of Apple's products, is an almost ephemeral piece of technology. Like the Macbook Air, it's the kind of thing you might ridicule upon hearing about, but when you see one, let alone actually start using one, it becomes some obscure object of desire. What it does it does not only well, but elegantly. The new 32GB model features not only more storage, but also a range of new application functionality – it's essentially an iPhone without the phone. The new apps all take advantage of wireless connectivity, and while, for instance, using Google Maps on the iPod isn't as convenient as using a dedicated GPS, it's still damn handy.

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Halo 3 Messenger Bag

Price $US39.99 Website www.thinkgeek.com

Everybody needs to carry stuff. From books and notepads, right up to gaming laptops and tools for on the road repairs and upgrades, a prepared Atomican needs a good swag to tote their gear in. It's even better if, at the same time as carrying your stuff, your bag states your loyalties in no uncertain terms.

There's no clearer way to say to the universe that you stand against the Covenant and the Flood, and are on the side of Humanity, than with this Halo 3 Messenger bag. And it's roomy, too, with three zippered and four velcroed pouches. Made of heavy canvas, it's almost as tough as a suit of MJOLNIR armour, and it's certainly a lot more affordable.

Mediagate MG450HD

Price $379 Website www.anywhere.com.au

We had a look at a lower specced version of the Mediagate last issue, and we liked what we saw. This issue we got a higher specced Mediagate to poke around with, and we're more impressed than ever.

The new MG450HD, as those last two letters suggest, is fully HD compliant, offering up support for full 1080p video playback. Given that more media that you might, um, 'find' online – we don't know how and we don't want to! – is coming in HD format, this is no bad thing.

The MG450HD also boasts wireless connectivity to keep your media area cable-free, can be set up as an FTP server/client, and can be hooked up to your 5.1 sound system for pumping movie tunes.

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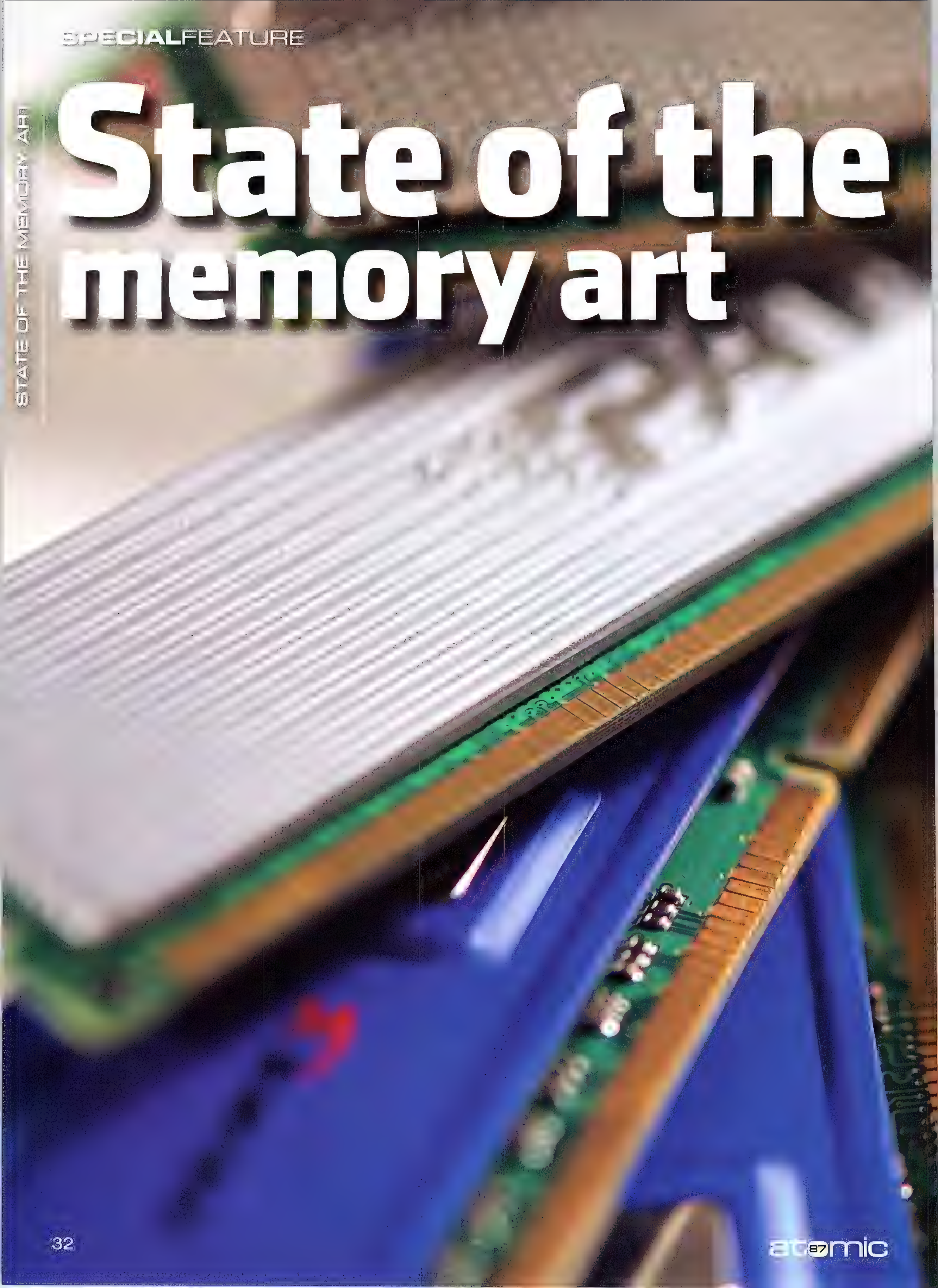
Price from 20/02/2008

State of the memory art



Time to upgrade? Or is DDR3 still not quite the right price? **Josh Collins** is here to work it all out.

The current memory market is a bit of a mess as smaller niche performance brands start to either hit harder in the enthusiast market or branch out into more value-oriented sectors. One brand doing this is Team Group; though originally based on the Xtreem range for the high-end enthusiast user, it has gone on to then also release the Xtreem Dark and Elite ranges over the past six to 12 months.

Add to the cauldron of the new market the entrance from Patriot memory – a huge brand from the North American sector – and the continued push from more established brands such as Corsair, OCZ, Kingston and G.Skill, and we end up with a very competitive field with price and performance laying down the law of what's hot and what's not.

While we may not have some of the other memory powerhouses such as Super Talent and Cellshock in the Australian market, we certainly still have plenty to choose from. In this roundup we've selected samples from the Australian market motivators and put each one head to head in a roundup that couldn't be more unique. Not unique in the hardware used but the methods needed to test – this will be covered as you read on.

With DDR2 still managing an utterly massive bang for your buck value, we've thrown some into the mix for good measure to see just where the enthusiast marketplace is at, right now.

Read on to find what's hot, what's not and where your hard earned dollars are best spent.

Good gear for good memories

To ensure we could push the necessary boundaries to properly test the kits of memory in this roundup, we chose to use the following core system components:

45nm Core 2 Duo processor
ASUS P5E3 Deluxe motherboard
NVIDIA 8800GTS 512MB graphics card

The 45nm Core 2 Duo processor used in this roundup has been pre-tested in combination with the motherboard of choice. The chip has been tested to easily achieve at or above a 550MHz FSB. With this, we can assure that 533MHz FSB testing will be completely stable and any instability will be due to the memory modules used.

There is no fair comparison

Testing memory can be a tricky business. When the 680i chipset dropped in on the enthusiast scene the dilemma of divider and FSB frequency matching was for the most part avoided due to a plethora of dividers automatically triggered to match a keyed frequency value. Unfortunately for this roundup there's yet to be a DDR3 platform that has the capability to isolate the memory frequency in such a way from the influence of the front side bus frequency.

It is due to these circumstances, and other limitations from other hardware such as the motherboard and CPU used, that we have chosen to max out the FSB – within the stable range of our motherboard and CPU combination – to find out the performance of these kits when paired with the type of system configuration an enthusiast would buy such kits for.

Given that DDR3 is still very much a high-end enthusiast-targeted solution we decided it was only right that we test in such an environment. As such, the testing platform for this roundup will be based on the necessary FSB to match the stock frequency of the memory.

It is important to note at this point that the higher FSB frequency that the kits are paired with (for example, a 533MHz FSB opposed to a 400MHz FSB) will carry with it a higher throughput of memory bandwidth. We'll also see ever-so slight changes in the processor's frequency as the multiplier is juggled to match the final CPU frequency as close as possible throughout the tests. In short, this type of testing is a royal pain in the rear and while it gives a general overview, it can't give an apples-to-apples comparison.

THE JOYS OF NO ASYNCHRONOUS MEMORY OVERCLOCKING

Other combinations such as 600MHz FSB on the 2:3 divider would provide an end memory frequency of 900MHz (1800MHz effective) however testing on a 600MHz FSB is not representative of the large majority of enthusiast systems and not to mention that getting a chip past the magic 600MHz barrier is an achievement in itself, much less running full intensive benchmark suites at such a frequency.

Testing procedures

For the testing of the modules in this roundup we'll be using the following memory related benchmarks:

Super Pi 4M
Super Pi 8M
Everest Read

Everest Write
Everest Latency
Hexus Pi Fast
3DMark06

To test the different kits of memory properly and appropriately we've had to pay particular attention to the memory dividers and FSB frequencies used. As a side effect of this, there will be differences in the final CPU frequency across the tests. This in itself isn't such a big deal, but the difference in FSB between the DDR3-1600 kit @ 400x8 and the DDR3-1600 kit @ 533x6 will produce sizeable differences in the results purely due to the sizeable increase in the FSB frequency. For this reason, it is important to keep the FSB frequency in mind when considering the results of this roundup:

DDR3-1866MHz kits:
467MHz FSB x7 on 1:2 divider
DDR3-1800MHz kits:
450MHz FSB x7 on 1:2 divider
DDR3-1600MHz kits:
400MHz FSB x8 on 1:2 divider
533MHz FSB x6 on 2:3 divider
DDR3-1375MHz kits:
458MHz FSB x7 on 2:3 divider
515MHz FSB x6 on 3:4 divider

The CPU is kept as close to 3200MHz as possible, dependent on the multiplier and FSB frequency. Below is a list of the different FSB frequencies used and the resultant CPU speed:

533*6.0 = 3198MHz
515*6.0 = 3090MHz
500*6.5 = 3250MHz
467*7.0 = 3269MHz
458*7.0 = 3206MHz
450*7.0 = 3150MHz
413*7.5 = 3097MHz
400*8.0 = 3200MHz

And that's it for the hows and the whys of our testing methodologies. What you're really waiting for are results...

WHERE'S THE DDR2 RESULTS?

We tested the new 45nm based Core 2 Duo on the X38 chipset and it was capable of 560-565MHz FSB – sweet, that's perfect for the roundup.

The use of the 45nm processor meant the results obtained in this roundup would have more relevance in the future market place – 45nm Core 2 Duo processors should be readily available by the time you're reading this. All was sweet while testing on the P5E3 Deluxe, with the processor and motherboard combination capable of achieving the necessary Front Side Bus frequencies needed to reach a number of the memory frequencies in this roundup.

If the unavailability of a chipset capable of asynchronous memory overclocking wasn't hard enough to deal with, we soon learnt that the 45nm processors were seeing FSB overclocking issues when paired with recent chipsets and DDR2. Having tested a number of boards and BIOS revisions, including the ASUS Blitz Formula, which still holds the labs record for achieving 593MHz FSB with our 65nm Core 2 Duo test chip, we were left up the proverbial brown creek. With the chip struggling to maintain any resemblance of stability at FSB frequencies as 'low' as 400MHz we were left honestly scratching our heads.

After discussions with fellow overclockers who had the 45nm based Core 2 Duos in their overclocking, overvolting, torturing little mitts we soon learnt we weren't the only ones having issues. At the time of testing the chips appear to be more at home in the P965 chipset based motherboards than any other – quite amusing due to Intel never officially announcing that the P965 chipset supports such chips. Not only that; the best FSB overclocks have so far (as we go to press) been achieved on boards such as the legendary ASUS P5B Deluxe and Commando.

For these numerous and complicated reasons, we've chosen to strike the DDR2 testing from this roundup due to the architectural differences and generational gap between the Bearlake based X38 chipset and the Broadwater based P965 chipset. As an alternative, we can only advise that for relative comparison, recent reviews such as the one of the Team Xtreem PC2-9600 C5 on page 49, be looked upon for guidance. Do note, however, that the testing is undertaken on a 680i chipset-based motherboard as per our normal DDR2 testing.

IC SUPERIORITY

It's a known fact that the Micron D9 IC is currently, as with the DDR2 market, the leader within the DDR3 market. Not only is it the leader, it is the dominant force with a product that, quite frankly, cannot be matched when it comes to the performance stakes.

As a point of difference to demonstrate this, the Kingston Hyper-X DDR3-1375 kit – which was reviewed back in issue 80 and is not based on Micron D9 ICs – but rather Elpida ICs has been included in this roundup. While the DDR3-1375 kit is not at the same level as the rest of the Micron D9 based kits, the Hyper X range does include two Micron D9-based kits above this particular kit in the product hierarchy. Rated at DDR3-1625 7-7-7-20 1.9v and DDR3-1800 8-8-8-24 1.9v respectively, these two kits would be the rightful competition for the other kits taking part in this roundup.

Brand	Patriot	Corsair	OCZ	G.Skill	Team Group	GeIL	Kingston
Series	Low Latency	Dominator	Platinum	HZ	Xtreem	Evo One	Hyper X
Type	DDR3	DDR3	DDR3	DDR3	DDR3	DDR3	DDR3
Capacity	2x1GB Kit	2x1GB Kit	2x1GB Kit	2x1GB Kit	2x1GB Kit	2x1GB Kit	2x1GB Kit
Frequency	DDR3-1866	DDR3-1800	DDR3-1800	DDR3-1600	DDR3-1600	DDR3-1600	DDR3-1375
Bandwidth	15000	14400	14400	12800	12800	12800	11000
Latencies	8-8-8-28	7-7-7-20	8-8-8-27	7-7-7-18	7-7-7-21	7-7-7-24	7-7-7-20
Operating voltage	1.9v	2.1v	1.9v	1.9v	1.75v-1.85v	1.9v	1.7v

Patriot

Series: **Low Latency** Street price: **$644** Supplier **Australia IT** Website **www.australiait.com.au**
Memory type **DDR3** Capacity **2GB (2x1GB kit)** Operating DDR frequency **DDR3-1866**
Bandwidth rating **PC3-15000** Primary latencies **8-8-8-28** Warranted operating voltages **1.9v**

Using raw frequency, the Patriot Low Latency kit took out the gold in the majority of the benchmark results. It's interesting to acknowledge at this point in time the heavy influence the FSB frequency had on the Everest write results – further proving the fact that high FSB frequency opens up hugely improved bandwidth.

At the end of the day this is a drool-worthy kit, as are most of the highly binned Micron D9-based DDR3 memory, but we felt that Patriot was sitting a little too far on the conservative side of the timings fence. While Patriot may well be happy in its comfy grey cardigan-like state, we would especially like to see some more aggressive memory timings on the company's high end kits, most notably the loose tRAS value.

Corsair

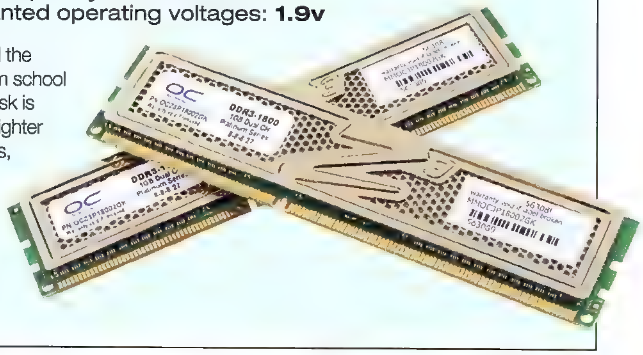
Series **Dominator** Street price **$776** Supplier **Corsair** Website **www.corsair.com**
Memory type **DDR3** Capacity **2GB (2x1GB kit)** Operating DDR frequency **DDR3-1800**
Bandwidth rating **PC3-14400** Primary latencies **7-7-7-20** Warranted operating voltages **2.1v**

Unluckily for the Corsair Dominator kit, the extra MHz on the FSB and the higher end memory frequency obtained by the Patriot Low Latency meant that the Corsair kit could not catch the Patriot kit in the Super Pi 4M and 8M benchmarks. However, the tighter latencies of the Corsair Dominators brought the kit within sniffing range of the Patriots in the Everest read and write results and exceeded them in the latency result. Not surprisingly, this competition was soon dismissed as another frequency lovin' benchmark gave the gold to the Patriot kit.

With the Patriot kit bragging an extra 33MHz on the memory (66MHz double data rate [DDR] in effect) as well as an extra 119MHz on the CPU due to the FSB manipulation necessary to achieve the stock memory specifications, the end battle would likely be awarded to the Corsair Dominators based on a purely handicap ruling, though.

OCZ

Series **Platinum** Street price **$547** Supplier **Australia IT** Website **www.ocztechnology.com**
Memory type **DDR3** Capacity **2GB (2x1GB kit)** Operating DDR frequency: **DDR3-1800**
Bandwidth rating **PC3-14400** Primary latencies **8-8-8-27** Warranted operating voltages: **1.9v**



The OCZ Platinum is the most relaxed kit of the lot, considering the Micron D9 ICs used and the representation found in the other kits in the round up. This particular kit would be the kid from school that always sat around being lazy but when given a bit of a prodding would blitz whatever task is at hand. That's exactly the potential in this kit. We've seen Micron D9-based DDR3 both at tighter stock ratings as found in the Corsair Dominator kit while maintaining comparable frequencies, but we also know that all of the Micron-based kits in this roundup are capable of some exceptional speeds and timings when given some attention and tweaked outside of the stock specifications.

With comparatively loose timings, particularly the tRAS value, the OCZ Platinum kit lags behind it's class competition and even gets nipped at the heels and exceeded by the DDR3-1600 kits, albeit those kits receive an extra 50MHz on the CPU due to the FSB frequency and multiplier but at the same time the OCZ receive a 50MHz higher FSB frequency.

Kingston

Series **Hyper X** Street price **$614** Supplier **Kingston** Website **www.kingston.com**
Memory type **DDR3** Capacity **2GB (2x1GB kit)** Operating DDR frequency **DDR3-1375**
Bandwidth rating **PC3-11000** Primary latencies **7-7-7-20** Warranted operating voltages **1.7v**

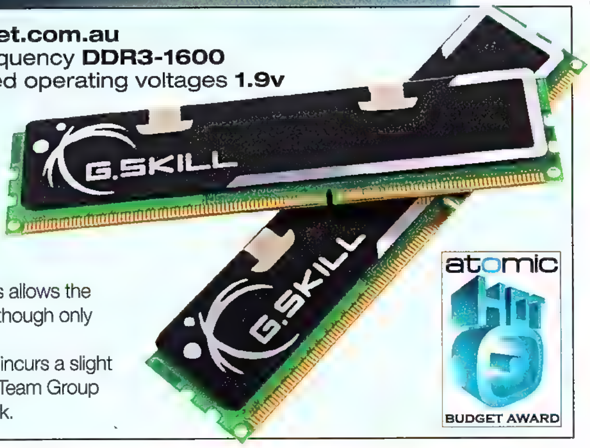
As noted in the IC superiority box out, this kit has been included to show and demonstrate the differences between this Elpida IC based kit and the other Micron D9 kits.

The most notable difference in this kit compared to the others is the much lower memory frequency while maintaining memory latency values that are akin to the Micron D9 kits rated 120+MHz higher (240+MHz effective DDR). This much lower operating frequency with comparatively loose timings brings with it a performance deficit when compared to the that obtained from one of the Micron D9 based kits.

Shockingly, due to being a part of the Hyper X range, this kit still demands a cost premium within the market; this slower performing memory comes with a very similar price to that of the Team Group Xtreem memory, which is Micron D9 based. We know which one we'd choose.

G.Skill

Series **HZ** Street price **$550** Supplier **BroNet** Website **www.bronet.com.au**
Memory type **DDR3** Capacity **2GB (2x1GB kit)** Operating DDR frequency **DDR3-1600**
Bandwidth rating **PC3-12800** Primary latencies **7-7-7-18** Warranted operating voltages **1.9v**



atomic
BUDGET AWARD

Renowned within overclocking circles for the early HZ series in the DDR2 market, G.Skill has now brought through the same series branding to the DDR3 realm. In doing so, G.Skill has continued the use of aggressive timings paired with comparatively aggressive frequencies – though admittedly, we'd like to see some CAS6 action on the DDR3-1600 parts, not only from G.Skill but other vendors too.

As if to tease us towards our yearnings for a stock DDR3-1600 kit with CAS6 associated latencies, the HZ kit implements a tRAS value of 18 – not a value commonly associated with CAS7-based timing sets. None the less, this sign of aggressive stock timings allows the G.Skill HZ kit to edge out its DDR3-1600 competition when riding on a high FSB frequency; though only ever, ever so slightly.

Interestingly, it appears that when paired with a lower FSB frequency, the tight tRAS value incurs a slight performance deficit compared to the more traditional value of 21 found implemented on the Team Group kit. Then again, this could also be related to the margin of error/difference with the benchmark.

Team Group

Series **Xtreem** Street price **$678** Supplier **Multimedia Technologies** Website **www.mmt.com.au**
Memory type **DDR3** Capacity **2GB (2x1GB kit)** Operating DDR frequency **DDR3-1600**
Bandwidth rating **PC3-12800** Primary latencies **7-7-7-21** Warranted operating voltages **1.75v – 1.95v**

Team
XTREEM
www.teamgroup.com.tw
XTREEM
www.teamgroup.com.tw

One of the first companies to provide DDR3 commercially and also one of the first to feature Micron D9 ICs, this kit was very quickly marketed and geared towards the enthusiast and overclocking buyer. We tested this kit in a previous issue of Atomic, and it proved to be a good overclocker – as would be expected due to the IC. It was also sitting at a price similar to that of quality performance DDR2 only 12 to 18 months ago, and with increased performance, it is a strong reminder of how quickly DDR3 is progressing as a technology and moving from the enthusiast into the early adopter market.

With very little difference between the Team Group kit and the G.Skill and GeIL kits in this particular rating class, it's hard to truly select one that is 'better' than the other. With the only true differences being the chosen stock tRAS value, the kits will ultimately be fighting in the market based on brand loyalty and awareness, product availability and price point.

GeIL

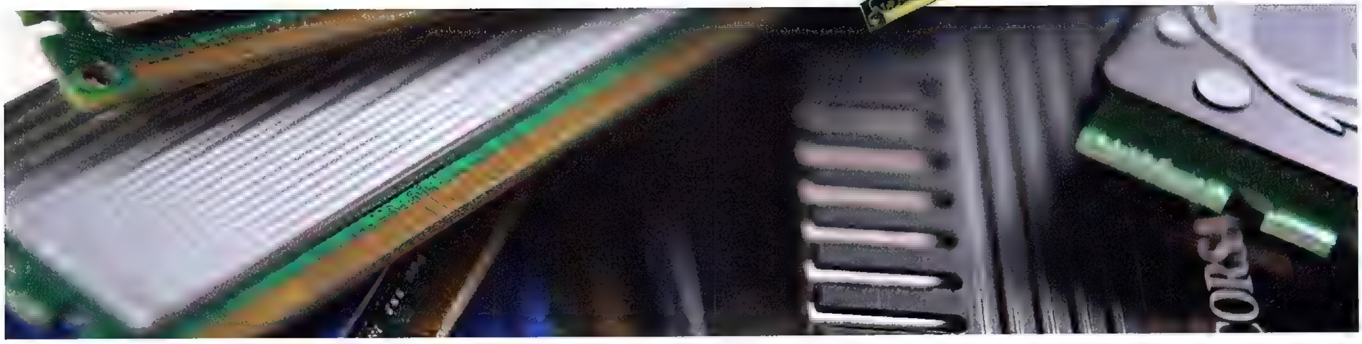
Series **Evo One** Street price **TBC** Supplier **GeIL** Website **www.geilusa.com**
Memory type **DDR3** Capacity **2GB (2x1GB kit)** Operating DDR frequency **DDR3-1600**
Bandwidth rating **PC3-12800** Primary latencies **7-7-7-24** Warranted operating voltages **1.9v**

DDR3
XMP
XMP
GeIL

GeIL is a brand that, although maintaining a presence in the Australian market, hasn't been making much noise recently within the enthusiast and overclocking quarters. With the newly released Evo One lines of memory, this absence could possibly turn around. This will no doubt depend heavily on the manner in which the new product range is received as well as the availability of the product.

In the market, at the time of writing, availability of the new Micron D9 based Evo One DDR3-1600 kit is scarce to say the least. However with the 2GB and 4GB kits of Evo One DDR2 spreading throughout the retail market we can only hope that GeIL can secure the allocation of ICs from Micron to sufficiently fill the market with product.

Performance of the kit is much the same as the other two DDR3-1600 CAS7-based kits and although the tRAS value is lower than the other two kits, at 24, the kit does have an interesting heat-piped heatsink to keep the li'l buggers cool.



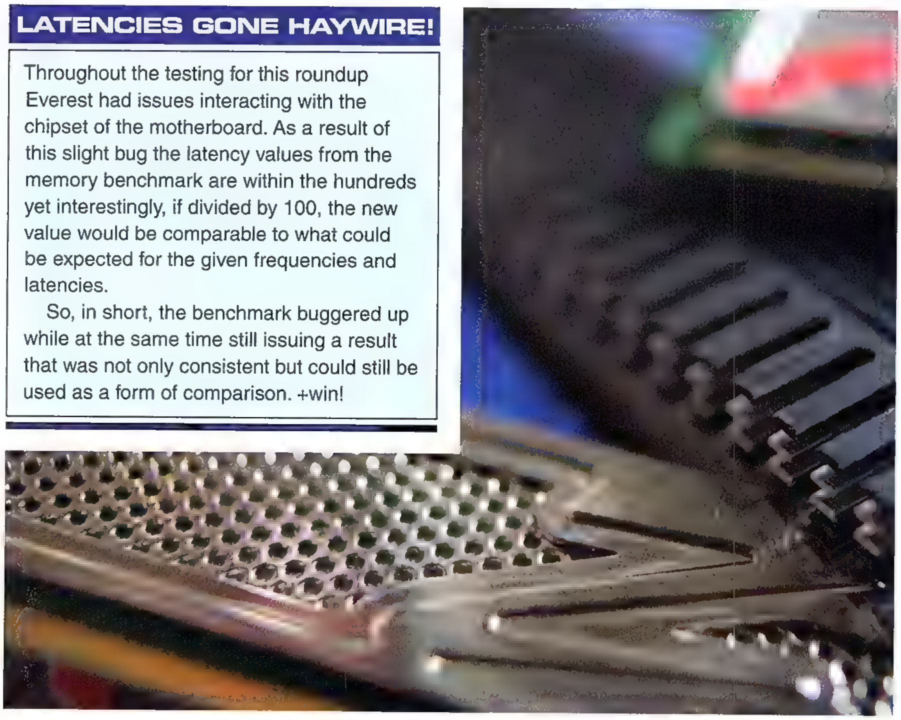
Model	FSB x Multi	Divider – Frequency	Timings	Super Pi 4M	Super Pi 8M	Everest Read	Everest Write	Everest Latency	Hexus Pi Fast	3DMark06
Patriot LL	467MHz x 7	1:2 – 1869MHz	8-8-8-24 2T	1m 15.312s	2m 48.094s	11920MB/s	9962MB/s	505.7ns	27.53s	N/A – unexplained instability
Corsair Dominator	450MHz x7	1:2 – 1800MHz	7-7-7-20 2T	1m 17.766s	2m 53.109s	11818MB/s	9567MB/s	503.4ns	28.52s	12833
OCZ Platinum	450MHz x7	1:2 – 1800MHz	8-8-8-27 2T	1m 18.406s	2m 54.562s	11419MB/s	9567MB/s	525.9ns	28.61s	12830
G.Skill HZ	400MHz x8	1:2 – 1600MHz	7-7-7-18 2T	1m 18.328s	2m 55.234s	10175MB/s	8508MB/s	524.4ns	28.36s	12886
G.Skill HZ	533MHz x6	2:3 – 1599MHz	7-7-7-18 2T	1m 17.672s	2m 53.203s	11085MB/s	11292MB/s	644.7ns	28.24s	N/A – unexplained instability
Team Xtreem (DDR3)	400MHz x8	1:2 – 1600MHz	7-7-7-21 2T	1m 18.359s	2m 55.172s	10176MB/s	8507MB/s	523.6ns	28.33s	12884
Team Xtreem (DDR3)	533MHz x6	2:3 – 1599MHz	7-7-7-21 2T	1m 17.578s	2m 53.110s	11080MB/s	11289MB/s	645.0ns	28.25s	N/A – unexplained instability
GelL Evo One	400MHz x8	1:2 – 1600MHz	7-7-7-24 2T	1m 18.500s	2m 55.594s	10192MB/s	8538MB/s	523.1ns	28.36s	12877
GelL Evo One	533MHz x6	2:3 – 1599MHz	7-7-7-24 2T	1m 17.875s	2m 53.640s	11080MB/s	11287MB/s	643.4ns	28.25s	N/A – unexplained instability
Kingston Hyper X	457MHz x7	2:3 – 1374MHz	7-7-7-20 2T	1m 18.797s	2m 56.937s	9795MB/s	9748MB/s	624.1ns	28.38s	12873
Kingston Hyper X	515MHz x6	3:4 – 1374MHz	7-7-7-20 2T	1m 20.485s	2m 59.500s	10354MB/s	10923MB/s	692.4ns	29.17s	11220

Represents best scores ▨

LATENCIES GONE HAYWIRE!

Throughout the testing for this roundup Everest had issues interacting with the chipset of the motherboard. As a result of this slight bug the latency values from the memory benchmark are within the hundreds yet interestingly, if divided by 100, the new value would be comparable to what could be expected for the given frequencies and latencies.

So, in short, the benchmark buggered up while at the same time still issuing a result that was not only consistent but could still be used as a form of comparison. +win!



Conclusion

Over the past months we've been watching as DDR3 continues to come of age and does so quite quickly compared with the switching period from DDR to DDR2.

If you're looking to purchase a quality kit of DDR3 memory, it's really quite hard to go wrong at this point in time, as long as the desired kit is based on Micron D9 ICs to take advantage of current high performance levels and future longevity for the product's life cycle.

We've had a number of these kits in over the past months and, due to the early stages of the product cycle, the only true difference between one and the other is how aggressively the IC used on the module has been binned. Combine highly and aggressively binned ICs with memory tweaking knowledge and a splash of trial and error and it really is quite hard to go wrong. That said, we do feel that Patriot is out in front in terms of high end DDR3 performance, while the G.Skill kit represents an excellent choice for the more budget conscious.

Go forth, embrace this wonderful new tech and enjoy.

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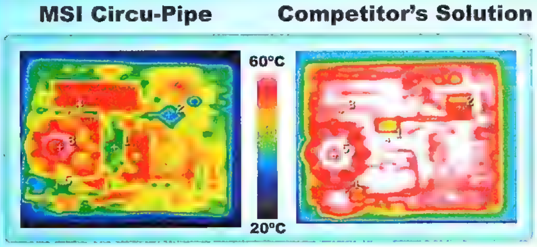
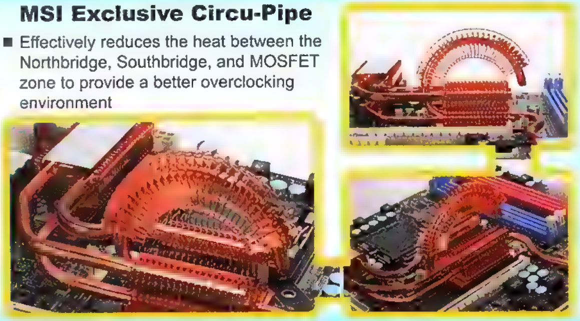


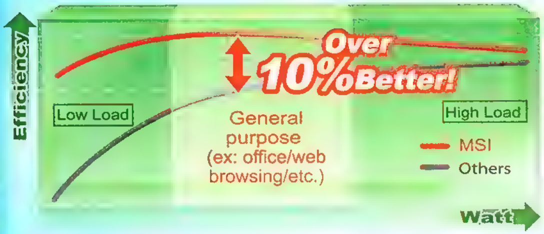
- MSI exclusive Circu-Pipe reduces system temperature by 20% when compared to the competitor's solutions

MSI Exclusive Circu-Pipe

- Effectively reduces the heat between the Northbridge, Southbridge, and MOSFET zone to provide a better overclocking environment

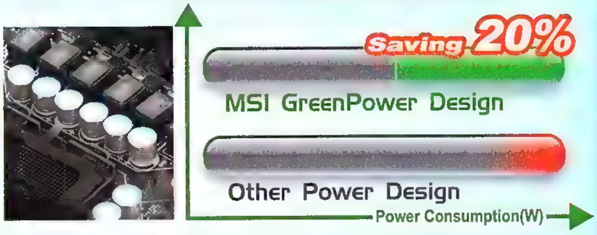


MSI Power Solution Vs. Others



- Based on testing MSI motherboards can reduce power consumption by approximately 10% when compared to other brands. This reduction is equivalent to 52.5kg of CO2 emissions saved every year.

MSI 4 Phase dual-Channel PWM



- MSI utilizes a 4 phases PWM with Dual-Channel design that not only reduces the power consumption but also guarantees system stability.

MSI exclusive Circu-Pipe solution is available to MSI Platinum & MSI Diamond series motherboards including the MSI P7N Diamond, MSI P7N SLI Platinum, MSI X48C Platinum and MSI P35 Platinum [illegible]

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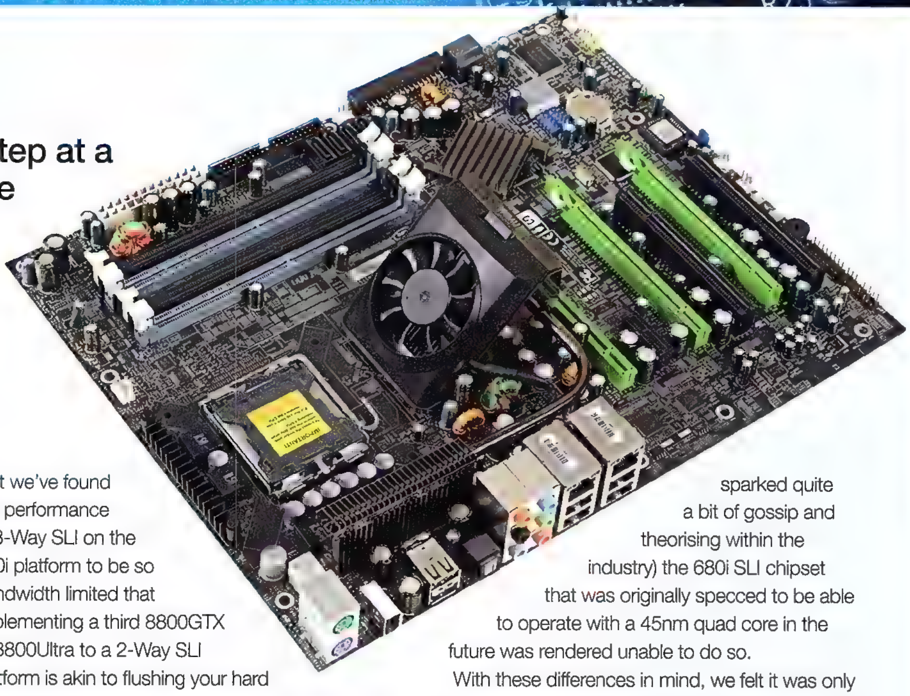
XFX 780i SLI

Josh Collins takes things one step at a time, and ponders whether three really is better than two.

SPECS

Price **$404**
Supplier **XFX**
Website **www.xfxforce.com**
Specifications **Socket 775; NVIDIA 780i northbridge; nForce 200 SLI bridge chip; ATX form factor; solid state capacitors; 3x PCIe 2.0 x16; 2x PCI; 1x PCIe x1; 1x EIDE; 6x SATA II; 1x FireWire; 1333MHz FSB; DDR2-1200; 6x USB 2.0 on rear I/O; 2x gigabit LAN**



XFX has become a prominent partner of NVIDIA's over the past years. In more recent times it was one of two partners – the other being eVGA – given the opportunity to be launch partners with NVIDIA for the latest update to the SLI motherboard range in the form of the 780i SLI motherboard.

With that partnership, XFX now has its own branded range of the NVIDIA reference 780i design, just as occurred with the 680i SLI motherboard. This means that while the boards available from XFX and eVGA are physically and technically the same, the BIOS development and functionality is fleshed out by XFX.

With the technicalities as to why two boards on the market look identical out of the way, it's time to jump into the real tech and see what truly drives this board… only, well, sorry peeps but it truly is much of a muchness compared with the 680i SLI series that it replaces. The physical layout of the slots, buttons, sockets and all the rest of it is nearly identical to the 680i SLI boards, much of the chipset architectures are the same, the socket area is the same… heck, strip the heatsink and paint the PCIe and DIMM slots blue again and you'd be hard pressed to find the difference between the 680i and 780i.

So, what the hell is the difference? Well, the real selling point of this motherboard is two component capabilities and a new standard implementation that the 780i SLI either simply does or does better than its 680i SLI brethren.

The first of these differences is implementation and management of SLI on a hardware communication level. The 680i SLI motherboard incorporates the nForce 100 to manage the communication between the PCIe sockets and the graphics processing units operating within them. Due to the number of PCIe lanes available from the nForce 100 chip, the configurations available for SLI operation are either two PCIe x16 slots running at x16 speed electrically for 2-Way SLI or three PCIe x16 slots running at x8 speed electrically for 3-Way SLI. What this results in is a PCIe bandwidth bottleneck when implementing 3-Way SLI on a 680i based platform. Such a bottleneck in fact, that we've found the performance of 3-Way SLI on the 680i platform to be so bandwidth limited that implementing a third 8800GTX or 8800Ultra to a 2-Way SLI platform is akin to flushing your hard earned dollars down the toilet.

To solve these bandwidth issues and allow for additional PCIe lanes to service the graphics processing units, the nForce 200 chip was developed and is implemented in the 780i SLI platform. This upgrade – if you choose to think of it like that – to the platform allows for three PCIe x16 lanes to operate at the full x16 electrical transfer speeds when implementing a 3-Way SLI configuration. This in return allows for the GPUs to operate in a faster general environment and increases the efficiency of communication between the cards and overall graphics processing of the 3-Way SLI system.

The second component capability that the 780i SLI features that the 680i SLI does not is the ability to utilise Intel's latest 45nm quad core processors. With a last minute change in the design and functionality of the 45nm quad cores (which sparked quite a bit of gossip and theorising within the industry) the 680i SLI chipset that was originally specced to be able to operate with a 45nm quad core in the future was rendered unable to do so.

With these differences in mind, we felt it was only right that our testing was undertaken with an Intel 45nm quad core processor and to say the very least we can say; yup, it works. We expect loaded up enthusiasts, either looking to upgrade or purchase whole new systems to implement an Intel 45nm quad core and SLI capability, to be very happy. This alone will force buyers towards the 780i SLI rather than the cheaper 680i SLI.

There is a third major difference, however: the inclusion of and certification for a recently released open standard called Enthusiast System Architecture, or simply ESA, which not surprisingly is spearheaded by NVIDIA.

This certification allows for another layer of communication between the hardware and the end user, allowing for real-time component monitoring and tuning dependent on rules and policies that can be set to allow for optimum performance with minimal effort by the end user. This is a really

Standard benchmark results

45nm Core 2 Quad used in testing	333x9; DDR2-1000 4-4-4-10 2T			429x7; DDR2-1000 4-4-4-10 2T			400x10; DDR2-1000 4-4-4-10 2T		
Super Pi 4M	1m 32.290s			1m 29.508s			1m 15.519s		
wPrime 32M	12.980s			12.916s			9.812s		
Hexus Pi Fast	32.29s			32.23s			25.16s		
CineBench – single-thread	3312			3321			4417		
CineBench – multi-thread	11534			11851			15360		
Everest read	9246MB/s			10671MB/s			11210MB/s		
Everest write	7106MB/s			9123MB/s			8505MB/s		
Everest latency	62.6s			53.3ns			50.4ns		
Crysis (1 card)	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max
	20.12	12.42	22.98	20.15	12.92	23.04	20.16	14.99	22.83
3DMark06 (1 card)	13245			13288			13839		
3DMark03 (1 card)	41146			41487			43790		

2-Way and 3-Way SLI results breakdown

45nm Core 2 Quad @ 400x10; DDR2-1000 4-4-4-10 2T

	Crysis			3DMark06	3DMark03
1x 8800GTX	Avg	Min	Max	13839	43790
	20.16	14.99	22.83		
2x 8800GTX	Avg	Min	Max	19960	68703
	28.51	19.93	41.53		
3x 8800GTX	Avg	Min	Max	20579	83896

Percentage breakdown of 2-Way and 3-Way SLI efficiency

45nm Core 2 Quad @ 400x10; DDR2-1000 4-4-4-10 2T

	Crysis			3DMark06	3DMark03
1x 8800GTX	Avg	Min	Max	-	-
	-	-	-		
2x 8800GTX	Avg	Min	Max	+30.7%	+39.3%
Compared to single card	+29.3%	+24.8	+45.1		
3x 8800GTX	Avg	Min	Max	+32.8%	+47.9%
Compared to single card	+31.1%	+26.7%	+60.6%		
Compared to 2-Way SLI	+2.5%	+2.5%	+28.2%	+3.1%	+18.2%

great idea for those looking to enjoy their gaming experience, while not being the greatest of hardware boffins, to assure optimum performance is gained from the system.

As much as we've rattled on about how much it looks much the same, feels much the same and operates much the same as its predecessor, at the end of the day it's an update to a platform that has maintained a place in a volatile enthusiast market. Furthermore it develops on some of the original shortcomings of the 680i SLI platform; though there's a few that still need a look in.

While there have been steps taken in regards to PCIe bandwidth management, support for the latest CPUs and optimisations of the system's resources through a standard such as ESA, we're left perplexed as well as somewhat frustrated as to why, especially on an enthusiast level product, there has been no progression in areas such as component selection and implantation.

Perhaps the biggest sore spot of this oversight is the lack of complete solid state capacitors on this motherboard, with a few confined to the socket area for CPU voltage regulation and the rest set for a life of mediocrity as electrolytic capacitors. High-end motherboards from the likes of GIGABYTE and ASUS, on the other hand, utilise full solid state capacitors across the ranges – many of which are much cheaper than the NVIDIA reference design motherboards. Even after discussions with some of the world's best overclockers, NVIDIA still does not implement solid state capacitors. Note to NVIDIA: use them!

Another area that still needs attention is the voltage regulation across the board. Many of the high-end motherboards, again from the enthusiast market leaders GIGABYTE and ASUS, feature a high phase count for power management; often between eight and 12 phases for the CPU socket area and two for the memory. This kind of regulation helps to assure smooth, consistent and stable supply to the key components in a system. Unfortunately, on the sample we tested we found considerable voltage drop and voltage droop. One such instance saw a BIOS-set CPU vcore of 1.5125v drop to 1.45v upon idling and drooping to 1.422v under load – that's almost a 100mv difference between BIOS set and achieved value! Not only this, but we also found that the set voltage was jumping in large stages and then only modifying slightly and not accurately according to the values settable in the BIOS.

Out of curiosity, during testing of the 2-Way SLI and 3-Way SLI we plugged in our power meter to measure how many watts we were pulling at the wall with this system. With an Intel 45nm quad core processor set at 4GHz (400x10) cooled by the Noctua NH-U12P, 2GB (2x 1GB) of DDR2 at DDR2-1000 4-4-4-10 2T, a Western Digital Raptor, two 8800GTX in SLI and several fans the system drew a peak of 460W from the wall. Adding an additional 8800GTX to this configuration to create a 3-Way SLI system we then saw a marked increase in watts drawn from the wall with the system peaking at 570W.

This new board has come into the market with a good start thanks to the solid foundations laid by its predecessor; now it's time for it to prove itself and, with any luck, the next iteration of the SLI platform will show even further improvements, updates and upgrades.

SCORE 7.5 OUT OF 10

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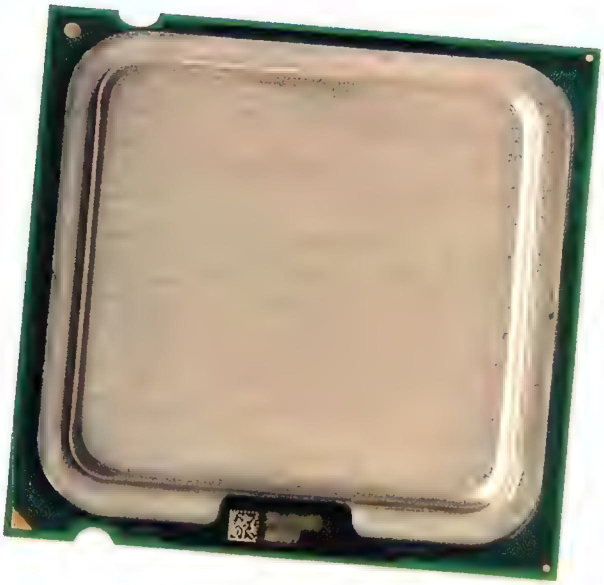
Intel Core 2 Duo E8500

Is this chip a budget winner or a sore also-ran to its Quad buddies? Josh Collins knows...



SPECS

Street Price **$361**
Supplier **Intel**
Website **www.intel.com**
Specifications **45nm manufacturing process; high-K metal gate technology; 3.16GHz (333x9.5); 6MB L2 cache; SSE4 instructions; 820 million transistors; 107mm² die size; 333MHz FSB (1,333MHz quad pumped)**

Over the last few issues we've seen the new 45nm quad core processors from Intel pass through the labs – these were the QX9650, QX9770 and QX9775. With the big boys now having gone their merry way, we decided it was time to look at a chip that will not only have strong gaming performance but that is within the more common price range of the average Atomic reader.

Going for a smooth price around the $361 mark, at the time of print, the E8500 represents another step in the evolution of the Core 2 Duo range. The new E8000-series of chips sees the introduction of the 45nm manufacturing process in a dual core processor format. The new chips maintain the same stock 333MHz FSB (1,333MHz quad pumped) as was introduced in the E6x50-series processors but introduces the SSE4 instruction set to the fray – great news for anyone heavily into video and audio encoding and decoding.

As to testing, the most interesting thing about this chip is what the 'every-man' can achieve with this newcomer from Intel while maintaining a performance spec system. To do this we paired the processor with an ASUS P5E3 Deluxe – as used in the QX9770 review in issue 86 – and a set of Corsair Dominator DDR3-1800 C7 memory, and cooled the CPU using a Noctua NH-U12P heatsink.

First up, it was necessary to set a base level for comparison; to do so we ran through the benchmark suites with the processor running at the stock settings of 333MHz FSB with a 9.5x multiplier resulting in a 3.16GHz end frequency. The next step from here was to test the maximum FSB. To do this we dropped the multiplier to the lowest available, 6x, and got on our way, making incremental steps upward in the FSB frequency before we either hit an FSB wall or instability occurred.

The end result was a maximum FSB frequency of 560MHz on this particular platform – considerably higher than its quad core brethren the QX9770, which managed a 475MHz maximum FSB. This large difference between the dual core and quad core FSB is not that surprising, with similar differences occurring between the E6000-series dual core and Q6000-series quad cores.

After the issues we had in the DDR3 memory roundup while using this processor on P35 based motherboards – check out the feature on page 32 for further info – we investigated the issue and found we weren't the only ones finding poor FSB overclocking on the newer chipsets and that, surprisingly, the best overclocks were being had on older P965-based motherboards; there are massive FSB overclocks being achieved on legendary P965 boards such as the ASUS P5B Deluxe and Commando. Team.AU's own dinos22, pro and moloko recently took an E8500 as far as 590MHz FSB with a 9.5x multiplier resulting in a 5.6GHz overclock on an old school P5B Deluxe – what stopped them from going further? An FSB wall was hit and could not be exceeded; the chip hit this insane speed on as little as 1.67v under liquid nitrogen cooling.

> “The new E8000-series of chips sees the introduction of of the 45nm process in dual cores...”

Having found our maximum FSB we started to push the boundaries with where this chip could go under an enthusiast level third party air based heatsink – we used the Noctua NH-U12P for this part of the testing. Doing so, we stayed on the maximum multiplier of 9.5 and cranked the FSB frequency. After some time tweaking and stepping through the FSB ranges we finished with a maximum CPU frequency validation of 4.8GHz – on air! Lowering the CPU frquency by 300MHz was required to achieve full system stability to maintain our benchmarking suite, though. None the less, 4.5GHz on an air-based cooling solution is nothing to be upset about and further demonstrates the ridiculous ability the new Intel 45nm processors have to overclock.

Air cooling used for all results	333x9.5; DDR3-1333 5-5-5-15 2T	400x9.5; DDR3-1600 6-6-6-18 1T	421x9.5; DDR3-1686 6-6-6-18 1T	474x9.5; DDR3-1896 7-7-7-20 1T
Super Pi 4M	1m 19.031s	1m 06.750s	1m 03.344s	0m 56.687s
wPrime 32M	27.047s	22.625	21.266s	18.938s
3DMark06 CPU score	3013	3603	3799	4268
CineBench – single thread	3510	4193	4406	4962
CineBench – multi-thread	6748	8127	8517	9609
Everest read	9921MB/s	11188MB/s	11754MB/s	13177MB/s
Everest write	7077MB/s	8533MB/s	8985MB/s	10106MB/s
Everest latency	54.4ns	50.4ns	47.8ns	43.1ns

SCORE **8.5** OUT OF 10

Zotac 9600GT 512MB

Josh Collins takes a look at NVIDIA's latest and greatest. Is it the new budget king?

SPECS

Price $372
Supplier NVIDIA
Website www.nvidia.com
Specifications 725MHz core; 1000MHz memory (2000MHz effective); 1750MHz shader; based on 65nm G94 core; 64 stream processors; 512MB GDDR3; single slot active cooling solution; single 6-pin PCIe power connector

Another month and with that another new release from NVIDIA. This will either be welcomed with open arms or shunned with frustration by enthusiasts waiting for the long-delayed next top dog release. Either way, there's no denying that NVIDIA is filling the 'bang-for-buck' sector with attractive options and shamelessly hunting for the AMD's blood, and the scalps of the HD3850 and HD3870 series. Further, this latest release brings is the first of the 9-series – the next generation in NVIDIA's GeForce products.

Based on the G94 core and made on a 65nm manufacturing process, the 9600GT features 64 stream processors and 512MB of dedicated graphics memory that operates over a 256-bit memory bus. The number of total available stream processors is 50 per cent of that found on the 8800GTS 512MB, 57 per cent of that found on the 8800GT 512MB and 66 per cent of that found on the 8800GS 512MB. While these figures may sound low, they're much higher than the previous mid-range offerings in the form of the 8600GT and 8600GTS, with the 9600GT sporting double the amount of stream processors from the 32 found in the 8600-series to the previously noted 64 within the G94 core for the 9600GT.

We've gone through the figures and we now know where the card sits in regards to stream processors, but this isn't everything. A card can have a whole stack of stream processors available but unless there's the raw grunt to push data through performance will be average to say the least. To assure there's plenty of pushing power, the 9600GT sample we've tested from Zotac sports frequencies of 725MHz on the core, 1000MHz (2000MHz effective) on the memory and 1750MHz on the shaders.

Physically the 9600GT looks extremely similar to the 8800GT, based on the G92 core. Using the same single slot cooling solution and measuring in at the same length to boot, side by side even the PCBs look very similar. Nonetheless there are the technical intricacies that assure the difference between the two cards.

The new 45nm dual cores will no doubt start flooding the market by the time this is in your hands having a good read. Therefore we've chosen to step away from the usual use of a 65nm dual core clocked at 3.6GHz for testing and instead utilise a 45nm dual core processor clocked at 3.8GHz – all on air cooling.

As overclocks of 3.2GHz to 3.6GHz have been 'standard' 24/7 clocks for many of the 65nm chips residing in enthusiast systems, we strongly believe that clocks between 3.8GHz and 4.2GHz will become the new norm for the 45nm chips; as such testing has been performed at 3.8GHz with an overclocked FSB to 400MHz and using a 9.5x multiplier. Paired with this is a set of Corsair Dominator DDR3-1800 C7 memory tweaked to run at DDR3-1600 6-6-6-18 2T.

With the oh so 'wonderful' Vista Ultimate 32-bit installed, our glumness at dealing with such an OS was offset by watching the pretty gleam of the sun reflecting off of the ocean and the gentle shadows of the nearby palm trees found in Crysis. Running through our usual settings of 1280 x 1024 resolution and all the eye candy maxed out; the card recorded an average, minimum and maximum FPS result of 16.25, 12.46 and 18.87 respectively. Next the card was put through the 3DMark06 testing suite and pulled away with a confident 12,087 3DMarks. Not too shabby considering the card is set to be the mid-range product for the new 9-series product line.

At the time of writing, the necessary software to overclock the new release was not available. This means that for the time being we do not have any overclocking results for the card, but in truly Atomic fashion we'll be juicing up this new arrival as soon as we have the chance!

The 9600GT marks the launch of the 9-series, however in a back-to-front fashion compared to the previous launches of the 6, 7 and 8 series. Considering the marketplace it is set to slot into, we feel this particular offering is a very solid start to a new series.

SCORE 8.0 OUT OF 10

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PowerColor HD3870X2

Josh Collins clones himself to take on this double-threat of a graphics machine.

SPECS

Price **$572**
Supplier **Australia IT**
Website **www.australiait.com.au**
Specifications **825MHz core; 900MHz memory (1800MHz effective); based on two R680 cores; 55nm; 512MB GDDR3 per core (1GB total onboard); 320 unified shaders per core; dual slot active cooling solution; 6-pin + 8-pin PCIe power connectors**

PowerColor
HD 3870 X2

Two is better than one, right? Well this is the mentality AMD/ATI has progressed toward with its HD38xx series and in doing so, it imaginatively named the new flagship graphics processor the HD3870X2.

The HD3870X2 is effectively two HD3870 graphics processing units slapped side by side on a single PCB. Doing so means a number of core differences between the HD3870 and HD3870X2, both physically and technically, while also maintaining similarities considering the shared heritage of the two.

The new card consists of two R680 GPU cores with a total of 1024MB of onboard dedicated memory – each core receiving an isolated 512MB of memory to go about their business; just as if each was a separate GPU all together. Maintaining the 'two of the same old core' concept, each core sports 320 unified shaders and a 55nm manufacturing process. Where the card differs to its single GPU core brethren is in the physical stakes. The HD3870X2 is noticeably longer, measuring in at 26.7cm while also utilising an additional 8-pin PCIe power connection to assure the extra GPU gets the juice needed to run.

> This has been an area of concern for those into competitive benchmarking, or simply those into their tech.

The single PCB-dual GPU solution has an integrated CrossFire bridging chip to allow the two GPU cores to communicate and act as if they were two separate entities communicating over a conventional CrossFire configuration. This has also been an area of concern for those into competitive benchmarking, or simply into their tech. It brings up a whole mountain of arguments as to whether the card is classified as a single GPU or a multi-GPU solution – we'll leave this one to you, constant reader, to decide.

While the concept of dual GPUs on a single PCB is not anything new – check out the X1950Pro Dual from Sapphire for the last attempt – what is new in this case is the fact that the thing actually works. Not only does it work, it is not restricted to a single chipset like its forefather. To make sure this was true we tested this GPU on our NVIDIA 680i SLI motherboard test bench. We're pleased to report that the performance as well as the overclocking capability was as would be expected on any other chipset – predominantly dominated by native CrossFire multi-GPU support.

For our testing, a 65nm Intel Core 2 Duo processor was set to a 400MHz FSB and combined with a 9x multiplier to give an end processing frequency of 3.6GHz. Paired with this was a Corsair Dominator PC2-10000 C5 2GB memory kit at DDR2-1000 with latency timings of 4-4-4-10-4-20 2T. To assure we could take advantage of the GPU crippling capability of *Crysis* we formatted the system with Windows Vista Ultimate 32-bit.

With the kit configured and the card running stock frequencies of 825MHz core and 900MHz memory (1800MHz effective) per each core, we set it on its merry benchmarking way to plow through 3DMark06 and *Crysis*. And plow it did, raking in an impressive 15,342 3DMarks – approximately 5k more than a single HD3870 on the same test bench configuration.

Performance was also strong in *Crysis*, providing an average FPS of 17.02 and a maximum of 30.72 frames, but, oddly and much to our surprise, the minimum FPS dropped as low as 3.40 frames – we can only suggest this would be due to the dual GPU setup and a possible buffer problem. Hopefully we can see this odd minimum FPS result brought into line with further driver development.

Overclocking the card was an interesting affair. We had to treat the card as if it was a set of two single GPU cards in a CrossFire configuration. None the less, this particular sample managed 904.5MHz on both cores and 999MHz for both sets of 512MB memory with a step higher on each crystal-set resulting in artifacting. We knew from playing around with this card with the Team.AU crew that this was simply the card asking for more volts. For those adventurous in the ways of volt modding, these cards can return some very sizeable results when given the additional volts they yearn for – just be sure to have sufficient cooling!

With the overclocked frequencies set, the card saw a measly gain in 3DMark06, only scoring an extra 18 3DMarks, suggesting CPU limitations. It did excel in *Crysis*, however, with the average, maximum and minimum being bumped to 22.02, 32.46 and 5.94 FPS respectively.

This is an interesting concept, finally coming of age since its initial and rather ugly inception in the form of the X1950 Pro Dual; we welcome this newcomer and look forward to getting our hands on the CrossFire drivers, currently in development, that will allow for two HD3870X2 cards, with a total of four GPU cores, to communicate. **JC**

SCORE **8.5** OUT OF 10

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TOMORROW'S TECHNOLOGIES – TODAY

XFX 8800GS 384MB

SPECS

Price $264
Supplier XFX
Website www.xfxforce.com
Specifications 680MHz core; 800MHz memory (1600MHz effective); 1674MHz shader; based on G92 core; 96 stream pipelines; 384MB GDDR3; single slot active cooling solution; single 6-pin PCIe power connector

This was a sneaky release by any standards, with little publicity world-wide to announce this card. The 8800GS is a chopped down version of the G92 core, and sits below the 8800GT in the model hierarchy. Featuring 96 stream processors compared to the 112 of the G92 GT and 128 of the G92 GTS, the new GS card also operates on a slightly unusual 192-bit memory interface and sports 384MB of memory.

The NVIDIA reference 8800GS operates with a 550MHz core, 800MHz memory and 1375MHz shader. In typical XFX fashion, the card has been overclocked to feature frequencies of 680MHz on the core, the same 800MHz on the memory and an increase to 1674MHz on the shader.

With 96 stream processors it's no surprise then that the 8800GS can be compared to the 8800GTS 320MB offering based on the older G80 core. The 8800GS is clocked faster in all respects compared to the 8800GTS 320MB, however. Even though the 8800GS has more memory, sporting 384MB, the actually memory bandwidth is still much higher on the 8800GTS 320MB. This is to the tune of almost double that of the GS; this is primarily due to the much smaller memory interface of 192-bit opposed to the 320-bit seen on the 8800GTS 320MB.

Even with the higher memory bandwidth, we still found this single slot cooled budget 8800-series card to be a decent performer for the dollars spent. The card scored 10,321 in 3DMark06 and 14.90, 10.81 and 17.12 for the average, minimum and maximum respectively in our *Crysis* benchmark.

Testing with the 169.32 Vista 32-bit drivers and using Rivatuner v2.06 to overclock, the card managed to reach individual frequencies of 740MHz on the core, 1030MHz on the memory and 1836MHz for the shader frequency. However, when combined to complete the benchmark suite the clocks had to be lowered to 710MHz, 850MHz and 1782MHz respectively.

At the overclocked frequencies, the card managed a small increase in 3DMark06 to record a result of 10,803 and performance overall appears to have actually gone backwards, ever so slightly, for the *Crysis* results. We can only assume the odd results are due to unknown 'golden ratios' between the card frequencies. **JC**

CPU/Memory	**400x9; DDR2-1000 4-4-4-10 2T**			**400x9; DDR2-1000 4-4-4-10 2T**		
GPU Frequencies (core/ memory/shader) MHz	680/800/1674 (stock)			710/850/1782		
3DMark06	10,321			10,803		
Crysis (FPS)	Average	Minimum	Maximum	Average	Minimum	Maximum
	14.90	10.81	17.12	13.38	6.79	17.90

SCORE 7.5 OUT OF 10

XFX 8800GT 512MB

SPECS

Price $425
Supplier XFX
Website www.xfxforce.com
Specifications 670MHz core; 975MHz memory (1980MHz effective); 1650MHz shader; based on G92 core; 112 stream pipelines; 512MB GDDR3; single slot active cooling solution; single 6-pin PCIe power connector; custom XFX PCB design – non-reference

This is not the same XFX 8800GT 512MB reviewed in our roundup from issue 84. This is a revised edition of the card, now utilising a custom PCB design and sporting the trademark XFX black PCB and fluro green DVI port colours. This refresh features the same two-phase power management as the reference cards, and for those into the extreme ends of the enthusiast world, the same volt mod points as well. The cooler is the exact same as the reference NVIDIA design, and the same as that found on the initial XFX 8800GT 512MB.

With the similarities outlined already, it should come as no surprise that the clock frequencies, while they are overclocked, are much same as the original release albeit with 50MHz less on the shader. This means a core frequency of 670MHz with memory at 975MHz and a shader clock of 1650MHz.

At these speeds, the card scores 12,553 3DMarks and an average, minimum and maximum FPS of 18.85, 13.30 and 21.78 respectively in *Crysis* at a resolution of 1280 x 1024 and with all the eye candy maxed out. These kinds of results place it smack dead in the middle of the reference 8800GT 512MB and the reference 8800GTS 512MB – both based on the G92 core.

Firing up the duo of Rivatuner v2.06 and ATI Tool, we started to tinker with the frequencies of the card. We found the maximum stable frequencies required a step back to 735MHz, 975MHz and 1800MHz for the core, memory and shader. At these speeds the benchmarks returned almost 13k flat for 3DMark06 and an average, minimum and maximum FPS in *Crysis* of 19.73, 13.89 and 22.82 respectively.

With a faster reference-clocked 8800GTS 512MB available at around the same price point and a higher overclocked 8800GT 512MB available cheaper from other brands, we can only see serious fans of XFX going forth to purchase this card. A solid product, but unfortunately priced out of the market. **JC**

CPU/Memory	**400x9; DDR2-1000 4-4-4-10 2T**			**400x9; DDR2-1000 4-4-4-10 2T**		
GPU Frequencies (core/memory/ shader) MHz	670 /975 /1650 (stock)			735/975/1800		
3DMark06	12,553			13,012		
Crysis (FPS)	Average	Minimum	Maximum	Average	Minimum	Maximum
	18.85	13.30	21.78	19.73	13.89	22.82

SCORE 7.0 OUT OF 10

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Leadtek 8800GTS 512MB

SPECS

Price $413
Supplier Leadtek
Website www.leadtek.com
Specifications 650MHz core; 972MHz memory (1944MHz effective); 1625MHz shader; based on G92 core; 128 stream pipelines; 512MB GDDR3; dual slot active cooling solution; single 6-pin PCIe power connector

The Leadtek offering of the 8800GTS 512MB was one of the first if its kind to market and as such is about as reference-influenced as it can possibly be. The difference between an NVIDIA and Leadtek card is simply the sticker whacked on the HSF.

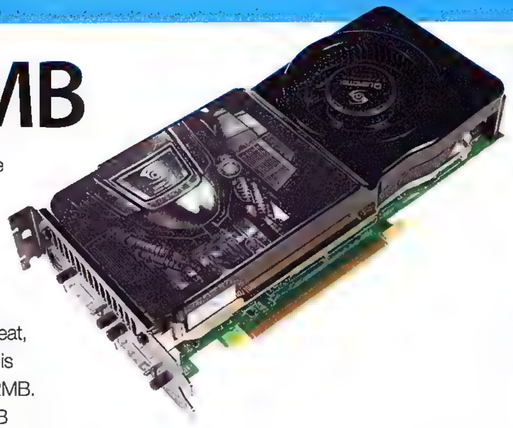
To help us run some *Crysis* benchmarks in all their eye candy, GPU-torturing, mesmerising glory, we ran the platform on Windows Vista Ultimate 32-bit for the DX10 love, running the 169.25 Vista 32-bit drivers.

As usual, we utilised a 65nm Core 2 Duo overclocked to a 400MHz FSB and placed on a 9x multiplier, effectively giving us a 3.6GHz end-processing frequency. To feed the beast, the memory was set to DDR2-1000 with latencies of 4-4-4-10-4-20 2T.

The first benchmark to be chewed up by the 8800GTS 512MB was the ol' faithful – 3DMark06. The 8800GTS 512MB ran through without breaking anything even resembling a sweat, cruising to a respectable 12,632 3DMarks – this is roughly 1.1k more than a reference 8800GT 512MB.

Continuing on to *Crysis*, the 8800GTS 512MB was still comparatively happy, but it was still obvious that the Cryengine was giving it a run for its money as it trudged its way through the benchmark. With the resolution at 1280 x 1024 and all eye candy on max, the Leadtek 8800GTS 512MB returned a respectable average, minimum and maximum fps of 19.6, 14.43 and 22.99 respectively.

Overclocking was an interesting affair. The overclock itself was effortless with the aid of Rivatuner v2.06, but the results were rather displaced. Testing the core, memory and shader frequencies individually, the results were 785MHz, 1100MHz and 1890MHz respectively. To maintain 3DMark06 stability with all maximum frequencies combined, the core frequency had to be lowered to 770MHz. Additionally, to maintain *Crysis*, the core was lowered to 770MHz, as well as the memory being lowered to 980MHz.



At the above overclocked settings the Leadtek 8800GTS 512MB went on to return results of 13,995 3DMarks and an average, minimum and maximum fps of 21.54, 16.17 and 25.14 respectively.

All in all, the Leadtek 8800GTS 512MB offers solid bang for your buck and out performs the likes of the 8800GTX and HD3870. **JC**

CPU/Memory	**400x9; DDR2-1000 4-4-4-10 2T**			**400x9; DDR2-1000 4-4-4-10 2T**		
GPU Frequencies (core/ memory/shader) MHz	650/972/1625 (stock)			770/1100/1890 (3DMark06) 750/980/1890 (Crysis)		
3DMark06	12632			13995		
Crysis (FPS)	Average	Minimum	Maximum	Average	Minimum	Maximum
	19.60	14.43	22.99	21.54	16.17	25.14

SCORE 8.0 OUT OF 10

TEAM Xtreem PC2-9600 C5

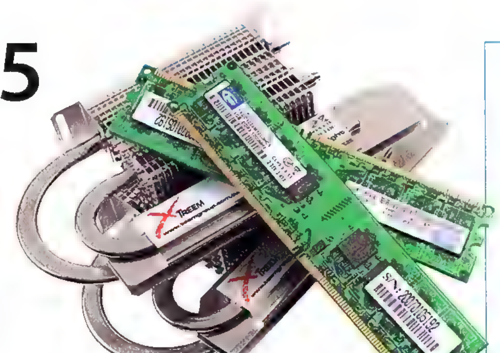
SPECS

Price $384
Supplier Multimedia Technology
Website www.mmt.com.au
Specifications DDR2-1200; 5-5-5-15 2T; PC2-9600; 2.35v-2.45v operating voltage; Micron D9GKX ICs; 2x 1GB kit; 240-pin DIMM; Non-ECC; Unbuffered DDR2; lifetime warranty.

Team Group has been making progress into the Australian market by hitting very hard in the enthusiast sector.

Rated at stock for DDR2-1200 frequencies and with a timing set of 5-5-5-15, these sticks are placed towards the rather pointy end of the market, alongside the likes of Corsair's Dominator range. With this area of the market unsurprisingly lead by highly binned and often hand-picked Micron D9 based modules, it's not much of a surprise when the kits endeavour to make the ICs clearly visible. That said, it's even less of a surprise that the ICs used on these modules are the top of the range and highly renowned Micron D9GKX.

Sporting some of the best goods in the scene, with top end ICs and cooling, we wanted to see what these modules were made of. First up was the run at the stock DDR2-1200 5-5-5-15, which was passed without any issues. Pressing on we then tested for the max frequency at latencies of 4-4-4-10 2T – a common favourite. Not surprisingly, the kit managed DDR2-1100 frequencies stable at 4-4-4-10 2T timings. With chipsets such as the P35, X38 and X48 we'd no doubt see the frequency edge up towards DDR2-1150.



We also checked out the maximum frequency for timings of 3-3-3-8 2T and found the max to be DDR2-800. These modules are obviously binned for high frequency and CAS 5 latency sets, as it eased on through to achieve DDR2-1250 with timings of 5-5-5-15 2T.

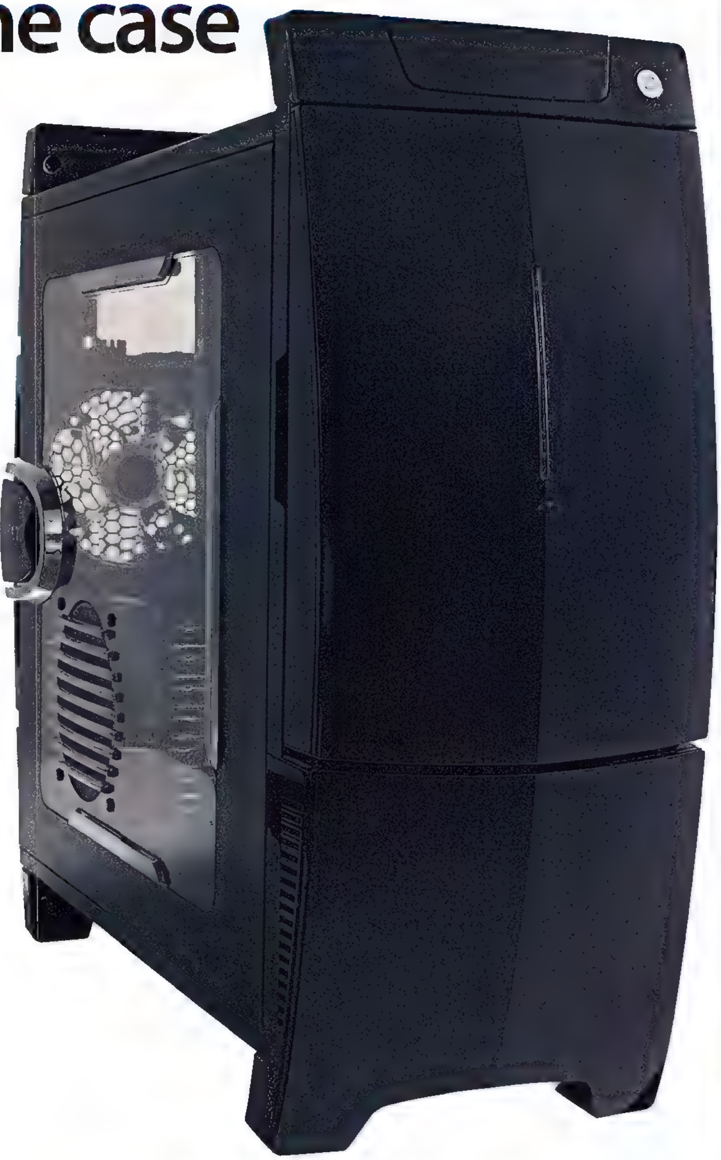
All in all a solid kit and, for this price, a great option for enthusiasts and gamers. **JC**

	400x9; DDR2-1200 5-5-5-15 2T	**400x9; DDR2-1100 4-4-4-10 2T**	**400x9; DDR2-857 3-3-3-8 2T**	**400x9; DDR2-1244 5-5-5-15 2T**
wPrime 32M	23.213s	22.997s	23.288s	23.166s
Hexus Pi Fast	27.04s	27.00s	28.33s	26.89s
Everest read	10655MB/s	10908MB/s	10619MB/s	10886MB/s
Everest write	7119MB/s	7119MB/s	7300MB/s	7119MB/s
Everest latency	52.5MB/s	53.1ns	54.1ns	51.9ns

SCORE 8.0 OUT OF 10

NZXT Lexa Blackline case

David Hollingworth knows what he hates, and he doesn't hate this.



SPECS
Price **$139.95**
Supplier **NZXT**
Website **www.nzxt.com**
Specifications **220 x 522 X 569mm (W x H x D); 11.5kg (net); ATX, Micro-ATX, Baby AT; 4x external 5.25in bays, 2x external 3.5in bays, 5x internal 3.5in bays; steel and plastic case.**

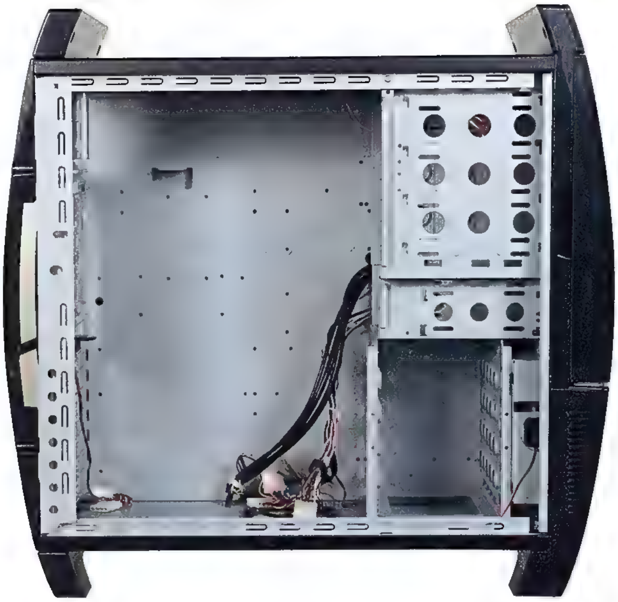
In the interests if total transparency between review writer, and review reader, we at Atomic HQ really should be honest. When it comes to case design, we're classicists. Lighting, windows and other bling is all well and good, but when you get down to it, at the end of the day we feel the very pinnacle of PC case design is a brushed aluminium Lian Li case. It's an elegant, timeless design – a near perfect ten out of ten. The case that, we like to think, God uses.

But what does that mean for a case like the Lexa Blackline from NZXT? It could easily mean trouble, as at first glance it's pretty much everything that the Lian Li is not. But dig a little deeper and the Blackline has a few elegant case solutions of its own…

Its design is nothing new from NZXT, but it's certainly very different from any case we've looked at recently. The curved front and back panels makes the whole box look like a rather fat and distorted letter H. This might seem like mere aesthetics, but there's some practicality to the design. The upper extensions make for a very easy grab point, while the lower ones give the Blackline excellent clearance off the desktop. With an 80mm fan mounted in the case's base, that clearance is a boon for airflow.

There's another 80mm fan at the top of the case, and a 120mm fan on both the front and the back plates. It's not a bad amount of airflow for a case at this price point, but we do feel the 80mm fans are not quite up to the job. On the flip side, the rear 120mm fan features a coloured LED, matched to the exclamation point shaped lighting on the case's curved front door – which, by the way, is available in red or blue. A tacky feeling plastic side window shows off this light extravaganza, and also houses another lit up 120mm blower.

Still, even if those 80mm jobbies do fail to sufficiently aerate and cool your gear, you'll know, as that's the other sneaky thing the top bit of the case's front plate hides. It just seems shiny black plastic like the rest of the case, but underneath is a small back-lit display that reads out the temperature via three probes in the case's interior. It's a nice touch that belies the otherwise 'form over function' feel of the case.



The internal build quality does seem a little slapdash, with a few rough and burred edges, but nothing that will see hordes of amputees at your next LAN day. Drives attach via included plastic rails, letting you slide hard drives and other bumpf easily in out of the ample amount of bays.

We have to say, the Blackline does seem a bit of a mixed bag, with blinged up 1337 gamer looks, but surprisingly enthusiast-geared cooling. It also features a steel frame, which adds a bit to the weight, but also makes the case nice and strong for those who like to lug their PC around. It might not look like a serious case, but it's got some chops where it counts, and for the price, it definitely has us impressed.

SCORE **7.0** OUT OF 10

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Cosmos S case

Coolermaster ups the ante on its Cosmos range, and David Hollingworth is in on the game.

SPECS

Price **TBC**
Supplier **Coolermaster**
Website **www.coolermaster.com.au**
Specifications **266 x 588 x 628mm (W x H x D); 13.8kg (net); ATX and E-ATX; 4x 3.5in bays (converted), 7x 5.25in bays; Black aluminium and mesh**

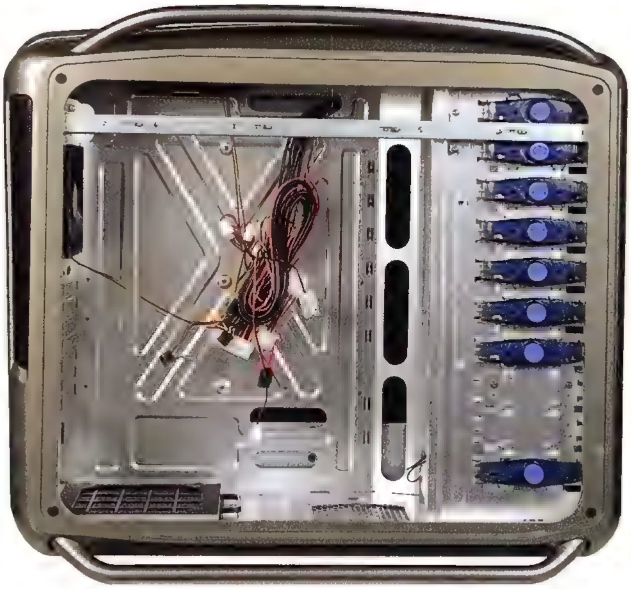
We've long been a fan of the Coolermaster Cosmos series, though we've had our gripes. For one thing, while those curving support arms might look weight bearing, the truth is they're about as strong as Woody Allen in a room full of adopted kids. The new Storm series, of which the Cosmos S is the flagship, fixes that problem right up – we were easily able to lift this new Cosmos out of its box by the arms, and we've been promised that they'll support even a fully laden case with oodles of gear.

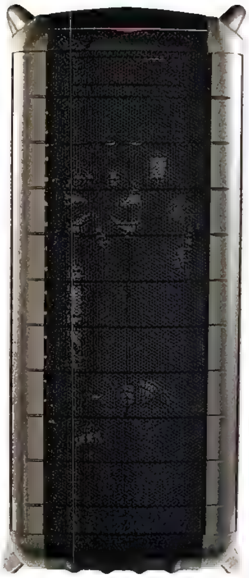
We look forward to properly testing this theory, but it looks to be a goer – you can immediately feel just how much more solid the case is, and not just in terms of those arms snapping off.

Our highly technical rattle test elicited barely any noise or vibration with or without the case sides attached. Externally, the case is a spare compromise between ventilation and black brushed aluminium that immediately had us considering words like 'sleek', 'handsome' and 'wow I really like this case'. Okay, that last is not a word, but you get the idea. The mesh covers the front fascia and the top, broken only by a smooth area that houses the IO ports and button-less power spot. Flip out two thin doors at front and you easily pop each mesh bay cover off.

There's a goodly number of fans inside the case, and that has also impacted on the external design, though not altogether negatively. The right side of the case is home to an impressive 200mm fan that could easily see the Cosmos hovering over your desktop, and so that case panel has a racing-car-like mesh intake to accommodate the airflow. Of all the Cosmos' design elements, this is the one that only your individual taste can judge.

As we said, airflow is a big feature of this case, with the aforementioned 200mm fan, plus 120mm fans at the front, top and rear. There's also mounting space for two more fans underneath, and another two up top. With all the mesh present in the fascia, the Cosmos can suck in a large volume of air. Alternately the top ventilation area can easily accommodate a radiator grill, and the case's rear houses two sturdy rubber grommets for just that eventuality.





The internal build is just as you would expect. Rounded edges prevail and you get a whopping seven 5.25in drive bays and four 3.5in bays to have your wicked storage way with. What's more, eight of the bays utilise a screw-less, push button design that makes swapping drives in and out as easy, as, well, pushing a button. The PSU sits at the bottom of the case, as well, making for a roomy environment for the motherboard and associated bits and bobs, and there are many holes and recesses for anally retentive cable management practices.

This is a great choice of case for any computer enthusiast, whether they be upgrade-aholics or overclocking fiends. And it looks great too; not that we're shallow or anything... **DH**

SCORE

9.0 OUT OF 10

Big Willy in action

David Field takes Big Willy off the grid, and a powerless suburb rejoices.

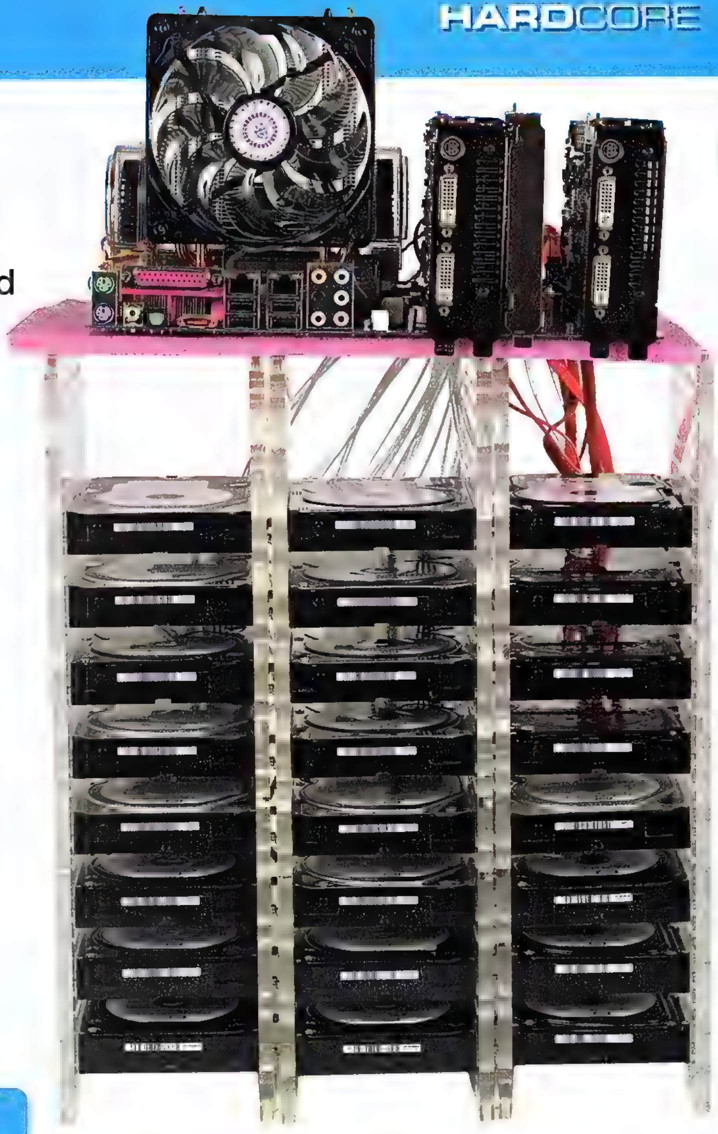
So what is it?

We've built the biggest single computer we could to see what happens to beefy power supplies when they are faced with a legitimately massive power draw.

Big Willy is 16 500GB Western Digital hard drives driven by an Adaptec 31605 SAS controller card and a further eight Raptors controlled by the Asus L1N64-SLI motherboard, which is home to two dual core FX-72 processors, 4GB of RAM, an 8800GTX and an 8800GTS.

Unfortunately, thanks to a slightly flaky engineering sample motherboard, we couldn't get SLI working. But the motherboard does let us use two processors, and their excessive power draw compensates for the lack of SLI: especially when you consider that traditional SMP processing has been sidelined in favor of dual and quad cores on a single processor.

By the time we were done, there were no more motherboard connections. We couldn't connect anything else to one computer, so we're considering this the ultimate power requirement saturation point. Run HD Tach, 3D Mark 06 and Orthos SuperPi simultaneously, and you have to ask the PSUs on the market today one question: can you power Big Willy? Well can you, punk?



Cooler Master Real Power M520 $129

BIG WILLY CERTIFIED

FAIL

The M520 is a nice piece of kit from many angles. It's modular and comes with braided cables. It claims to have an efficient 80 per cent-or-greater power factor. Its peak output delivery is 600 watts. It's also the very last PSU we've looked at with the current incarnation of our super-duper testing rig.

But it's rubbish; or at least, not good enough for Big Willy, and we trust Big Willy implicitly.

In fact, the M520 had no end of problems while it was on the test bench. We disconnected drive after drive from the motherboard until we had but a single system Raptor and our RAID left, and even then it still refused to play nice.

We started from scratch, this time pulling the power from the banks in the RAID – four drives at a time. And once the load was 16 drives lighter we still got nothing, so we kept going until there were but two Raptors connected to our system. We ran the stress test benchmarks and the M520 promptly shut down. After removing a drive and running a doubtlessly lonely ("Hello? Helloooo? I used to have soooo many friends…") system with a mere single Raptor, we saw the M520 hobble across the finish line.

It was quite a depressing result, but an expected one. We had a hunch that the PSU would fail before we tested it, and we used it as a guinea pig anyway to prove a point. If you have a whole enchilada rig with multiple graphics cards, hard drives and the rest of the modern computing essentials, do not for a minute think about running with less than 750 watts worth of power.

SPECS

3 rails 19A each

What did we learn?

The recurring theme from our months of testing shows that you're better off with a single rail power supply than an equally specced multiple rail power supply.

It's also highly unlikely that you're going to need more than 750 watts of proper power unless you're a nutcase overclocker who's not prepared to let voltages sag when doing silly things with hardware.

We have the increasing efficiency of components and a push toward green computing to thank for this. Bog standard Core 2 Duos generally lap up about 100 watts (say 110 after a moderate, fun and useful FSB squeeze) when in use, which is a very small amount compared to the last generation Pentium 4s, which would greedily wolf down double that and still be beaten in the performance stakes.

Even though you'd be hard pressed to build a PC thirstier than Big Willy (or perhaps not, if you have the money for a stupid and pointless (oh, such hate! *–ed*) Skulltrail behemoth) we'd still recommend looking at a 700W power supply for your PC.

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TOMORROW'S TECHNOLOGIES - TODAY

Asus C90

Has ASUS conquered the heights of mobile gaming? **David Hollingworth isn't quite convinced...**

SPECS
Price **$2199**
Supplier **ASUS**
Website **www.asus.com.au**
Specifications **Core 2 Duo E660; 2GB DDR2 667; 160GB SATA (5400rpm); DVD Super-multi drive; NVIDIA GeForce Go8600M GT 512MB; Windows Vista Ultimate**

It's a pretty established trend cum fact that if you see the word 'gaming' as part of a product's name or description, you can expect to pay a premium for it. Gaming mice, gaming keyboards, gaming headsets all seem far more expensive than their mortal counterparts. Part of that is that gaming hardware is often more performance focused, and comes with more bells and whistles; another part is that if something's 'cool', it'll always cost you more. Laptops are of course no exception, and given the scale, gaming laptops can set you back a pretty penny, given they need to combine high end performance with cutting edge portability.

How then, we wonder, does the ASUS C90 – which ASUS does tout as a gaming machine – cut the mustard while still being nearly half the cost of the Toshiba Satellite over the page?

It certainly doesn't cut corners on the design. The C90 features a piano-gloss finish with an inset swirly pattern that is reminiscent of a warped vinyl record. It's attractive, but very understated; certainly not the bold statement that the Dell M1730 makes. The display/lid opens up without need of fiddling with any catches or locks, and reveals a silvered interior with black inset keyboard.

> There is, however, a TV antenna jack, as the C90 is bundled with an external TV tuner. It's certainly a thoughtful inclusion...

This is where you can start to see where some corners have been, if not cut, then certainly scaled back. The keyboard, while very solid and responsive, is of the standard notebook size, albeit with full-size keys. Nor do you find the plethora of multimedia keys and similar jigger-pokery you'll find in more expensive performance machines. There's little lighting bling, too, with just a blue underlight to the power switch, and blue status LEDs. The speakers are not obvious, and rightly so; they're not bad, but most gamers or music lovers will prefer to plug in headphones rather than suffer the watery and bass-light sounds on offer.

Similarly, while the monitor is certainly bright enough, it's a space-saving 15.4in widescreen capable of 1280 x 800 resolution. Connectivity has also taken bit of a hit; there's a card reader, at least, but only a single USB port on top of eSATA, HDMI, Firewire and networking ports. There is, however, a TV antenna jack, as the C90 is bundled with an external TV tuner. It's certainly a thoughtful inclusion, and just one of many hints that this is not so much a gaming laptop as a low-end multimedia machine.

Performance is the ultimate arbiter of a machine's gaming and entertainment potential, however, so of course we benched the living daylights out the C90. Or, more accurately, we tried to.

We started off with 3DMark06. We couldn't run it at our usual 1280 x 1024, obviously, but we figured we'd at least get an idea of how the machine compares. Neither its CPU or its graphics are anything close to top end, so we were not expecting much. This was a good thing, as we didn't get much – our first run achieved a meagre 3244 3DMarks.

Not… ideal. The C90 did have a trick up its sleeve, in the shape of 'Overclocking Turbo Gear', a software solution to fiddle with the processor's FSB while also setting the big-arse fan unit that sits behind and underneath the screen to power up and down accordingly. We chose the gaming setting – which boosts performance by 10 per cent – and ran 3DMark06 again. We managed to top 3400 this time, which is not a huge improvement. There's a top setting, which promises a 15 to 20 per cent overclock, but… well, the display drivers kind of shat themselves at that point and the we very nearly blistered the paint of our testing bench.

Crysis was… sub-optimal. Let's just leave it at that.

We've mixed feelings about the C90. On the one hand, it's so very stripped back compared to other gaming laptops. You've simply got to admit that you'll never be playing modern games on this machine, or just look elsewhere if that's what you want a laptop achieve. But that said, at this price point any comparison between, say, the C90 and Dell's XPS laptops seems unfair at best. The C90 is very much a machine that you will compute on first, and might be able to game on a distant second. It's got some great media extras, and comes at an excellent price, but don't expect anything like 'gaming'-level performance.

SCORE
7.0
OUT OF 10

Toshiba Satellite X200

The gaming notebook niche is fast expanding – **David Hollingworth** sees if Toshiba's latest is a worthy addition.

SPECS

Price **$3999**
Supplier **Toshiba**
Website **www.toshiba.com.au**
Specifications **Intel® Core™ 2 Duo Processor T7800; 2GB (1GB+1GB) DDR2 (667); 400GB (200GB + 200GB) (4200rpm) SATA HD; HD DVD-ROM DVD SuperMulti Double/Dual Layer Drive; Dual NVIDIA GeForce 8600M GT graphics with NVIDIA SLI Technology; Windows Vista Ultimate.**

Once upon a time the mere suggestion that there was such a thing as a gaming laptop would be greeted with chortles and guffaws of incredulity from the suggestees, leaving the suggester reduced to a mere sham of a computing pundit. These days, it's a crowded segment, with computing stalwarts like Dell, ASUS and now Toshiba all laying claim to the market.

They're all doing a good job, too, and the neat thing is that they are all approaching the problem of how to fit a desktop's worth of power into a mobile laptop form factor from slightly different angles.

One thing all vendors seem to understand is that a gaming machine has to look the part, and Toshiba's Satellite X-200 is no exception.

The screen's fascia is a very pretty black and red (Toshiba calls it Carmine – fancy!) swirly design that is subtle, yet still enough to brand the X200 as something more than just some so-called 'road warrior's' PowerPoint enabler. The unit is studded with a variety of ports and connectivity options: four USB 2.0 ports, a network port and a DVD multi-drive on the right-hand edge; two more USB ports on the left along with eSATA, phone jack and more on the left, and a host of audio out options on the leading edge.

> ❝ ...as we often point out, if you're looking for maximum performance, you're not going to be buying a laptop. ❞

The full-size keyboard and its surrounding rest is a silvery plastic that looks like it will really show up stains (a badge of honour, for some users), and the keys themselves are nicely responsive, if a little plastic feeling.

The red (sorry, Carmine) theme continues with the a range of red LED indicators for power, drive activity an so on, as well as red-lit speakers for the remarkably impressive 5.1 harman/kardon speakers. And yes, we mean that – 5.1. Above the keyboard you've got four in-set speakers, and a slim sub sits under the leading edge. Performance-wise it's a far cry from a proper surround system, but its still just about the best sounding speaker set up we've seen on a laptop, and would put many lesser desktop set ups to shame.

But of course, the big question – can it cut the gaming mustard? We put the X200 into a small room with 3DMark06, the *Crysis* demo and a single rusty switchblade, then closed the door. After an hour or so of snarling, screaming and desperate sobbing we opened the door. It was not a pretty sight… The Satellite X200 was still standing, but it was battered and bruised, staggering about in a pool of its own blood. It was proud, though; even though it had to use some dirty tricks, and taken a few hits, it was still standing.

To be honest, though, it's just not that much of a powerhouse. The X200 managed a rather slow 6744 3DMarks, which is nearly 2000 less than the Dell XPS M1730 we recently looked at. *Crysis*, set to our standard 1280 x 1024 with all the flashy bits turned on nearly killed the poor thing – the best fps it could manage was a dawdling 6.31, and it even stuttered down to zero fps at one stage.

But as we often point out, if you're looking for maximum performance, you're not going to be buying a laptop. Out of curiosity we had a bit of a play with *Crysis'* settings to see if it were possible to get it running in any state. Just dropping all settings down to medium saw the demo return a more solid average frame rate of just over 15fps. After dropping the resolution down to a quaint and old fashioned 1024 x 768 the average ended up topping a respectable – and more playable – 21fps.

That's the trick, really, when it comes to gaming on the move – compromise. It might sound impressive to say that a laptop like the X200 is running a 2-way SLI set up with 8600M GTs, but without proper driver support – the constant bugbear of laptop gaming – you're simply never going to get top performance.

That said, there's a lot to like about the Satellite X200. The screen is crystal clear, the sound excellent, and it's both lighter and far cheaper than Dell's gaming beast while boasting features like a fingerprint scanner and card reader slot. For four grand, we think that's a pretty good deal.

SCORE 8.0 OUT OF 10

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Our choice for the best gear the land has to offer

There's nothing sexier than new kit. And whether you need to horde your pennies (Budget), want the most power for your dollar (Performance) or own a small mansion and a collection of sports cars (Extreme), we're here to help with this handy matrix of *Atomic* recommended products. You may find your needs fall between categories – that's okay, just mix and match to suit your budget! Each piece of kit has been reviewed hands-on in *Atomic*, so if you want to learn more, look up the issue and page number listed.

BUDGET

I can't afford to eat... gimme gear!

CPUs

intel

Intel Core 2 Duo

PRICE $100-$480

Stretch a little further and buy yourself a Core 2 Duo – you'll be thanking yourself later. The E4400 is the cheap ticket to speed, at $165.

AMD

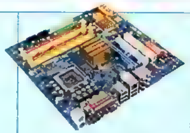
AMD Athlon 64 AM2 X2

PRICE $135-335

Cheap CPUs are a wonderful thing, and the X2s are now wonderfully cheap. The 3600+ is your budget baby at about $85.

Motherboards

intel



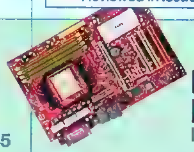
GIGABYTE GA-G33M-DS2R

PRICE: $132

Using the G33 northbridge and has overclocking performance like its full ATX brethren, this Micro-ATX offering is extraordinarily hard to pass up.

Reviewed in *Issue 81 – Page 52*

AMD



MSI K9N Neo F

PRICE $113

Excellent performance from a budget board, with plenty of legacy slots for upgraders. Don't expect to overclock though.

Reviewed in *Issue 68 – Page 33*

Memory

TEAM Xtreem Dark PC2-6400 C4

PRICE $95

Cheap, overclockable and good lookin' to boot. The modules fill the void that was previously left between cheap value RAM and enthusiast overclocking kits.

Reviewed in *Issue 80 – Page 56*

Video cards

Sapphire HD3850

PRICE $250

A great budget choice with some serious pixel-pushing chops, and an oustanding package of must-play games.

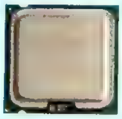
Reviewed in *Issue 85 – Page 53*

PERFORMANCE

Hardware that bangs the best for buck

CPUs

intel



Intel Core 2 Quad

PRICE $300-680

Core 2 Quad – a processing powerhouse, now affordable and overclockable like buggery. The Q6600 is the best buy, at about $336.

AMD

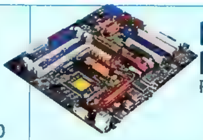
AMD Athlon 64 AM2 X2

PRICE $135-335

The X2 series are still fantastic chips, and in the face of the Intel threat are now going for cheap. The 6000+ is your current sweet spot at about $235.

Motherboards

intel



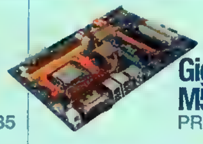
Foxconn P35 Mars

PRICE $236

A great board for the enthusiast with a mess of great ideas and good overclocking potential.

Reviewed in *Issue 85 – Page 48*

AMD



Gigabyte GA-M59SLI-S5

PRICE $250

Gigabyte delivers yet another affordable, feature-filled wonder of the 21st century.

Reviewed in *Issue 66 – Page 39*

Memory

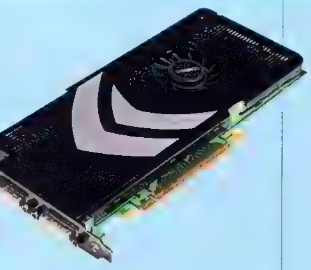
TEAM Xtreem Dark PC2-6400 C4

PRICE $95

Cheap, overclockable and good lookin' to boot. The modules fill the void that was previously left between cheap value RAM and enthusiast overclocking kits.

Reviewed in *Issue 80 – Page 56*

Video cards



GeForce 8800GT 512MB

PRICE $390

We are stunned at the price performance ratio of all the GT-based cards, but none caught our attention like this solidly benching mo-fo.

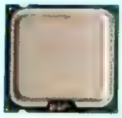
Reviewed in *Issue 84 – Page 36*

EXTREME

Gimme power. Money is no object.

CPUs

intel



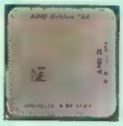
Intel Core 2 Extreme QX9775

PRICE $TBC

The cream of the overclocking crop, based on the new Yorkfield architecture. Truly, Lord of the CPUs.

Reviewed in *Issue 86 – Page 48*

AMD



AMD Athlon 64 FX-62

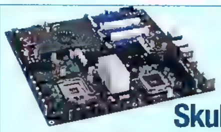
PRICE $1072

Sadly gets beaten by a mid range Core 2 Duo, but still the top of AMD's pile.

Reviewed in *Issue 66 – Page 39*

Motherboards

intel



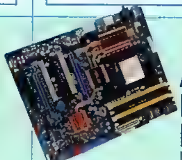
Skulltrail

PRICE $TBA

It's the craziest thing we've ever seen, and BY GOD we want three of them. Now.

Reviewed in *Issue 86 – Page 42*

AMD



ASUS M3A32-MVP Deluxe

PRICE $317

True perfection in a mobo form. Very well laid out and overclockable to boot.

Reviewed in *Issue 85 – Page 51*

Memory

FB Dimm Ram

PRICE $TBA

We got to look at an engineering sample of this server-grade RAM, and oooh... very drool worthy.

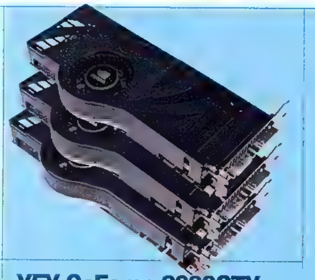
Corsair Dominator Twin2X 10,000

PRICE $1016

Crazy speed sticks that will also happily do 1T/800MHz/3-3-3-3. Comes with a fan attachment to keep things cool!

Reviewed in *Issue 77 – Page 58*

Video cards



XFX GeForce 8800GTX Ultra XXX Edition SLI

PRICE $998x3

This is far and away the most powerful graphics card on the market, but be willing to sacrifice your entire retirement fund for the privilege of having one of these tearing up your screen.

Reviewed in *Issue 78 – Page 59*

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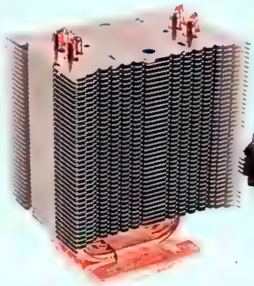
Coolers

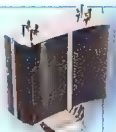


Noctua NH-U9F

PRICE $80

It may only be 90mm, but its cooling power is exemplary, coming in only slightly behind its 120mm brother.

Reviewed in *Issue 72 – Page 42*



Thermalright Ultra 120

PRICE $75

Tower cooling that will keep your tower cool. Whack a Nexus 120mm fan on for near silent cooling.

Reviewed in *Issue 72 – Page 42*

Thermalright Ultra 120

PRICE $85

Make sure you get the optional AM2 bracket (hence the higher price). Grab that same Nexus fan.

Reviewed in *Issue 72 – Page 42*

Asetek Vapochill Lightspeed

PRICE $1020

Vapour phase change. Ooooh. Vapour. Phase. Change. No matter how many times you say it, it's still cool (pun!)

Reviewed in *Issue 64 – Page 38*

Cool-Trek Vostok

PRICE $199

Until more extreme cooling systems come along that are AM2 compatible, this little kit will have to fill the gap. Make sure you get the updated mounting kit.

Reviewed in *Issue 68 – Page 41*

System drives

Samsung HD160JJ 160GB

PRICE $68

Super quiet and yet still fast, the 160GB Samsung offers excellent value for money.

Reviewed in *Issue 69 – Page 40*

Seagate Barracuda 7200.10 320GB

PRICE $95

Seagate's fancy new technology makes this beast both fat and fast. Mmm, toasty.

Reviewed in *Issue 69 – Page 40*

Western Digital Raptor WD1500ADFD

PRICE $264x2

Dear lord. The performance king hath cometh, short of whacking in a SCSI. Buy two and RAID 'em.

Reviewed in *Issue 62 – Page 40*

Displays

Samsung 931C

PRICE $323

2ms of raging colour gamuts and beautifully smooth tonality that will make you weep with joy and hug strangers.

Reviewed in *Issue 70 – Page 56*

Samsung 244T

PRICE $999

Brilliance at 24", the 244T offers 6ms gaming, a wonderful gamut and more inputs than an alien hooker.

Reviewed in *Issue 69 – Page 48*

Hewlett Packard LP3065

PRICE $2109

Thirty inches, 2560 x 1600, 8ms G2G. If you can handle the size and cost to run this massive beauty, you won't be disappointed.

Reviewed in *Issue 76 – Page 53*

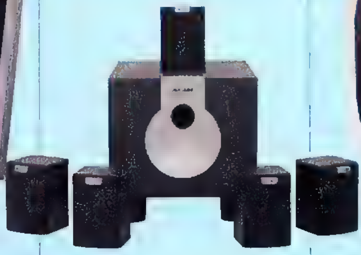
Speakers

Steelsound 5Hv2

PRICE $120

Awesome gaming audio performance on a shoestring budget. Phenomenal 'phones.

Reviewed in *Issue 73 – Page 43*



AVLabs AVL325

PRICE $165

While it can't hold a candle to the Z-5500D, with a price this low there's no excuse not to jump to 5.1.

Reviewed in *Issue 64 – Page 50*

Logitech Z-5500D

PRICE $363

Able to play the 'liquid gold' that is DTS 96KHz/24-bit, this 5.1 beast can wreck both home and hearing alike with equal impunity.

Reviewed in *Issue 48 – Page 56*

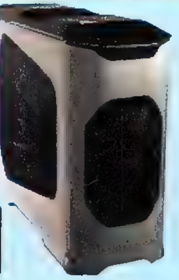
Cases

Lian Li PC-7S

PRICE $125

Quality, elegance, refinement and style. The trademarks of a Lian Li case, now available at an entry-level price.

Reviewed in *Issue 79 – Page 46*



Cooler Master Stacker 830

PRICE $285

Like the Stacker before it, this sensational Stacker stacks sumptuous specifications salaciously.

Reviewed in *Issue 61 – Page 36*

Silverstone TJ07

PRICE $348

The Silverstone Temjin TJ07 is a huge hulking beast that shows you mean business in the finest style. Impeccable finish and plenty of room means win.

Reviewed in *Issue 65 – Page 49*

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Differently friended

Josh Collins has friends in all kinds of places.

Friendship – it's a funny thing isn't it? For so many parts of our society, who you know, who they know, what you know about them, what they know about you and all other kinds of social interaction is predominantly determined by this little thing we call friendship. Now for many years there was a stereotype whereby 'geeks' or 'nerds' – particularly those of us into computer hardware, software and gaming – were considered to be the worst of the lot when it comes to having friends. Or rather, lots of them.

As the years have rolled on and computer development, in all essences of the phrase, has spurred human interaction not only to another level but into a completely different realm – the virtual– the once outcast or suspected socially secluded individuals deemed 'geeks' and 'nerds' by the masses are now basking in the glory of a culture turning ever more unreal. This realm is one that we, the geeks and nerds once hassled and ridiculed, know and know it well. Not only that, we're comfortable within it and have already learnt well and truly the art of mastering communication and utilising it.

> “Whether you happen to take advantage of these networks or loathe them beyond belief is irrelevant.”

It's for this reason that no longer can one of us be picked on for not having friends or not actively interacting with others. It's simply become more socially acceptable for us to use the means which we find easier to communicate with others in the first place, be it through irc, msn, forum message boards, emails or other methods classed outside of the traditional norm.

Naysayers and those who oppose the virtual realm – likely due to their own inability to take advantage of it – will often fall back on the comment that the friendships and interaction maintained through a virtual realm are not truly tangible, have no real world relevance and other such derogatory comments. Tradition is beautiful but when it's held onto in such an outwardly damaging manner it is lowered to a level that can only be pitied.

Right now, I'm typing this on a mate's computer. So what? How is that different or even relevant to what's been mentioned so far? The difference is that I'm in Adelaide and my home life is in Sydney and the Central Coast just north of Sydney. My mate? He's an overclocker from Adelaide; who I happen to have met through another overclocker based in Adelaide, both of whom I came in contact with through online overclocking forums. These blokes I can and do, with complete belief in the traditional meaning of the word, call good friends – as I do numerous other individuals and groups around Australia. While we may be able to be in easy contact through virtual realms and methods not considered traditional, I nonetheless have mates who I know I can depend on, trust and have a bloody good time with when we do manage to be in the same physical place at the same time.

This is not to say that friends, in the traditional sense, are no longer needed – that'd just be a rather lonely place for many hours of the day. What this does mean however is that there is the ability to have an ever-increasing network of friends; this in itself is a driving force for sites such as Facebook and MySpace. Whether you happen to take advantage of these networks or loathe them beyond belief is irrelevant. What these networks depict, however, is a growing acceptance for a means of communication and interaction that us geeks and nerds can be proud of.

So next time the chance comes along to chill with your gaming clanmate, overclocking buddy or war driving partner, from another suburb, city or state, know that friendship is what you make of it and if the connection between individuals and/or groups just so happens to take advantage of the technology we have available to us, then so be it.

Want to reach out and touch Josh?
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- Shader Clock: 1700MHz
- Memory Interface: 256bit
- 512MB DDR3 Frame Buffer Size

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GRAPHICS BY NVIDIA.

Your laptop is lying to you

Dan Rutter is all signal and no noise.

Your mobile phone is lying to you. So is your laptop. And not just when they whisper to you in the night.

Mobile phones, and most modern laptops, have signal strength and battery life displays. One or both of these displays has probably been the focus of all of your attention at one time or another. Neither display is actually telling you what you think it's telling you.

The signal strength bars on a mobile phone or laptop do, at least, say *something* about how strong the local signal is.

But they don't tell you the ratio between that signal and the inevitable, and often very considerable, that accompanies it.

A high signal strength is like your friend shouting at you. A high noise level at the same time is like your friend shouting at you while you both stand in the front row at a rock concert.

So if you've ever wondered why your phone can work fine with one rather unsteady bar of 'signal', or be noisy and cut out when it's got five bars, that's why. And the exact same applies to Wi-Fi signal strength displays, though it's easier to see signal to noise ratio (SNR) figures on a computer – just run a utility like NetStumbler.

Battery meters are even more fun.

It's possible to monitor the charge in a battery – any kind of battery – with considerable accuracy. There's a certain amount of guessing involved, because the 'fullness' of different battery chemistries doesn't necessarily map well to terminal voltage even under a steady load. But modern 'smart' batteries with little chips on them that keep track of how long they've been lasting lately really do work pretty well.

You may have noticed, however, that your mobile phone seems to spend an awful lot of time with its battery gauge saying it's full, or at least almost full.

Then, once you get to the half-full mark, the battery seems to go flat surprisingly quickly.

> “Then, once you get to the half-full mark, the battery seems to go flat surprisingly quickly.”

This phenomenon isn't as obvious with today's low-power-consumption phones than it was back in the days of 20-hour standby times, but it's still pretty hard to find a phone that doesn't do it.

There are two reasons for this. They are both bad.

Reason one: A battery that stays (apparently) full for a long time makes a phone look good. Even if it doesn't actually deserve to.

Reason two: When your phone still (apparently) has lots of charge left, you're more likely to use it. People who think their phone's going flat will make fewer, and shorter, calls. And that makes phone companies sad.

That's right – this is yet another example of the Curse of the Marketing Department. Both phone makers and cellular service providers want you to think that your phone is still pretty much full of charge even if it's almost half empty. So, many of them tweak the charge meters.

This is a particular problem in the US market, where most mobile phones are not just usually locked to one provider, but also *customised* for that provider, with specific firmware that can very easily include a battery meter with an even larger Lie Factor than usual.

If laptops had as much battery life as phones, I bet you'd see the same darn thing happening. You can't really get away with it when total run time is only a few hours, though, so this is one piece of nonsense laptop users have not yet had to suffer.

It's still worth noting, though, that there's no standard for what 'two bars of signal' is supposed to mean, for a mobile phone or for a laptop. It varies from device to device, at the very least.

And remember: Measuring signal without measuring noise is like only counting the goals *your* team scores.

Dan's batteries are always fully charged!
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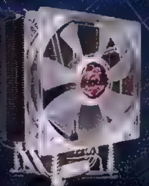

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GAMEPLAY

GAMES, GAMING AND GAMERS COVERED ATOMIC-STYLE

Good games are still kind of thin on the ground, but that doesn't mean we don't have some great stuff for you this month.

Logan Booker gets his glaive in a knot over Dark Sector, the upcoming shooter/slasher from DE. He chats up the devs (not like that!) and gets the lowdown on this moody birth-of-a-hero tale.

We catch up with gaming legend (though he's still not forgiven for Daikatana – ed) Jon Romero, and get the good oil on the making of DOOM, its history, and what he would have done with DOOM 3 if he were still with id. Say what you will about the man, he's still an entertaining guy. For actual gaming, we've got a preview of the latest Rainbow Six franchise entry. It's looking like an intriguing blend of innovation and more-of-the-same. Lock and load, people!

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Dark Sector 68
Catching some kind of viral bug while fighting your way through Eastern Europe has never looked so cool!

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The Rainbow team is back, and they're pissed off at missing Mardi Gras!

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Chris Taylor lets slip his love of all things criminal and gang-related. Who knew?

ASUS giveaway – win tech!
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Dissecting Dark Sector

Glaive in hand, **Logan Booker** hunts down *Dark Sector* producer Sheldon Carter from Digital Extremes.

Pariah? What the heck was that? Developer Digital Extremes told us it was a revolutionary shooter that made full use of pixel shaders, physics and high resolution textures, coupled with a full-flavoured and compelling plot. Sounds, smells and tastes like success in anyone's book.

In reality, we ended up with a by-the-numbers story and an extremely linear game. Sure the weapon upgrade mechanic mixed things up like man-jelly in a washing machine, but otherwise sleeping through the title was just as effective as playing it.

This, however, didn't make us angry. Disappointed yes, and maybe even a little upset, but DE's previous work on the *Unreal* franchise gave us hope that the developer was capable of more. And that 'more' would be so confronting it'd put your brother's browsing history to shame.

When we had a look at a preview of *Pariah* all those years ago, DE showed us its little secret – a project it'd just started work on that would trump *Pariah's* two-pair with a straight flush of awesomeness. The clip Digital Extremes had to show presented us with an armoured figure, sneaking down the corridor of a space ship. The graphics were supremo, the atmosphere intense and the scent... oh, it'd have your nose hairs ecstatically screaming Celtic slurs.

Dark Sector was the name of the game, and two years on Digital Extremes is not only happy to chat about its work, but admit that the release is not far away.

Sector sweep

Dark Sector has changed somewhat from the incarnation we were privy to back in the day. Gone is the hardcore sci-fi feel, replaced with a more conventional story involving a character called Hayden Tenno (who serves as the protagonist) and the CIA. Producer Sheldon Carter elaborates:

Nothing says evil like fleshy shambling things and faceless minions behind masks. Evil!

"*Dark Sector* is the superhero origin story of Hayden Tenno. At the beginning of the game, Hayden is a CIA cleaner who is sent to [the fictional country] Lasria on an assassination mission."

"Hayden is the type of guy who sees things very black and white and he is incredibly effective at doing his job. For him, infiltrating an eastern European city like Lasria is normally a cake-walk... and at the very beginning it is."

At this point the plot quite literally mutates, as Tenno contracts a deadly infection. He turns out to be resistant to its effects, thanks to a congenital defect that prevents him from feeling pain and instead of killing him, the infection grants him superhuman powers. As you progress through the game, these abilities will grow in strength and number.

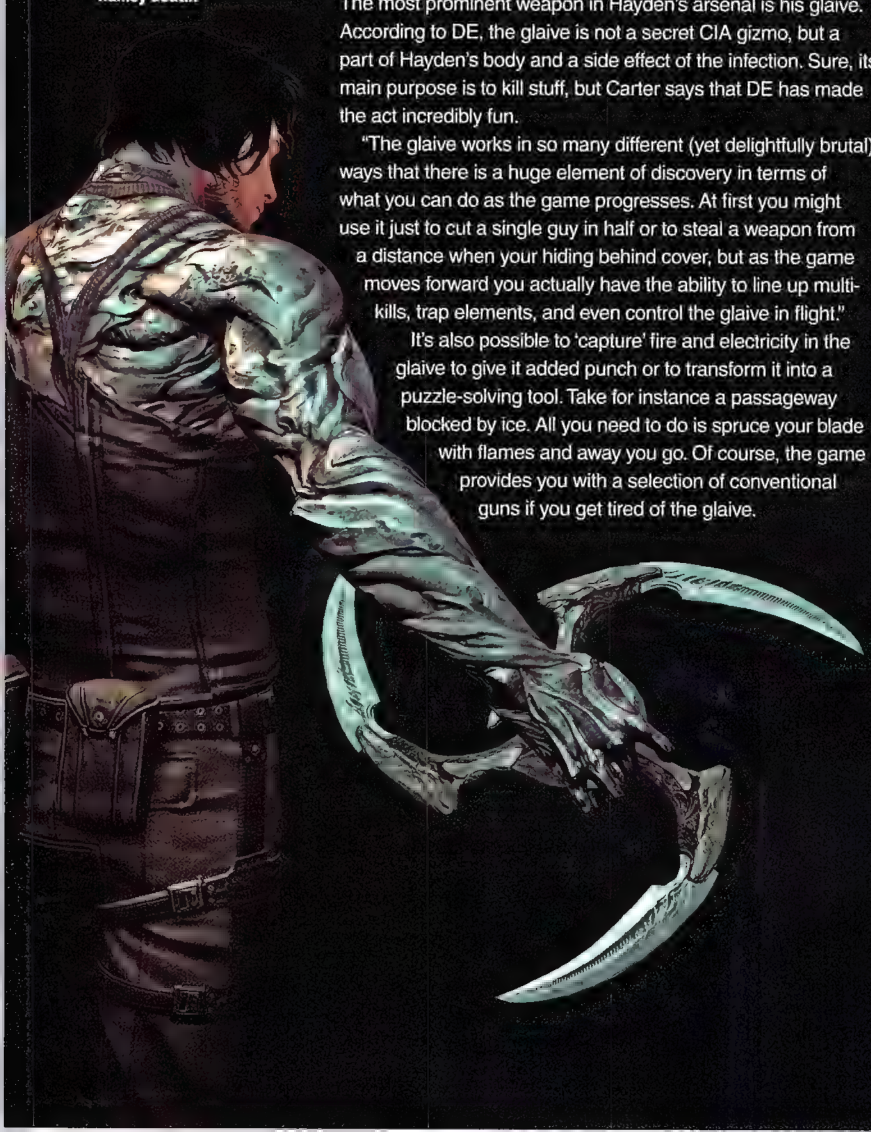
According to the producer, the original setting would not have allowed the developers to carry across the crux of the story – the birth of Hayden Tenno as a superhero.

"We compare it a lot to Spider-Man being in New York City – he just wouldn't stand out in a place where everyone had powers," says the producer.

"Same goes for Hayden; for the first game in the *Dark Sector* trilogy we needed Hayden to be the focal point." Yes, there are two additional games planned, but more on those later.

"We've gone to great lengths to make sure that you fully understand Hayden's struggle to master the monster he is physically evolving into while at the same time seeing how it is actually making him much more human," says Carter. Allies, enemies and plot twists will help solve the mystery surrounding the infection, Hayden's powers and Lasria itself.

Above: Very much the good and the bad sides of burny flamey death.



Glaive intentions

The most prominent weapon in Hayden's arsenal is his glaive. According to DE, the glaive is not a secret CIA gizmo, but a part of Hayden's body and a side effect of the infection. Sure, its main purpose is to kill stuff, but Carter says that DE has made the act incredibly fun.

"The glaive works in so many different (yet delightfully brutal) ways that there is a huge element of discovery in terms of what you can do as the game progresses. At first you might use it just to cut a single guy in half or to steal a weapon from a distance when your hiding behind cover, but as the game moves forward you actually have the ability to line up multi-kills, trap elements, and even control the glaive in flight."

It's also possible to 'capture' fire and electricity in the glaive to give it added punch or to transform it into a puzzle-solving tool. Take for instance a passageway blocked by ice. All you need to do is spruce your blade with flames and away you go. Of course, the game provides you with a selection of conventional guns if you get tired of the glaive.

> "Of course, the game provides you with a selection of conventional guns..."

At this stage multiplayer is planned, but Carter did not go into details.

"We're doing the full reveal soon, but what I can say about it is that it was critical for us to come up with modes that emphasised using the glaive. It's such a powerful and fun weapon that a lot of the standard multiplayer modes just didn't work." From the sounds of things, the developer is working hard to make *Dark Sector's* multiplayer unique.

Engine evolution

Carter was unable to plumb the dark depths of the game's technical aspects, but we do know a fair bit about them already.

Originally, *Dark Sector* was to use an engine called the Sector Engine. At some point it decided to rework the technology and the result was the Evolution Engine. What changed between the two, we're not exactly sure, but our best guess is that development moved from the Xbox/PS2 to next-gen consoles (and dumped the PC as a launch platform). Considering the massive differences in hardware and capabilities, it makes sense that the developer would opt for a refresh.

Evolution functions equally well on the Xbox 360 and Playstation 3, though the only preview we've seen was on the former. According to Carter, the PS3 proved the more trying platform to develop for, but it's nothing show-stopping.

Visually, the game resembles Epic's *Gears of War*, with the zoomed-out shoulder cam not helping to dissuade comparisons. It also explains why people assume *Dark Sector* uses Epic's Unreal Engine 3. Despite Digital Extremes' ties with the company, we can guarantee that the game's tech is the result of in-house programmer sweat.

When we asked Carter if the developer has encountered any significant hurdles, the producer came back to us with its decision to go with a HUD-less design.

What this means is that the game doesn't provide you with health bars, maps or ammo counts on-screen. While it helps with immersion, it makes it hard to provide the player with important information that's pretty much required to play the game properly.

"We feel that HUD elements keep poking the player in the eye and yelling 'this is a game'. We're very happy with how it worked out, but it definitely created its own share of problems," says Carter.

"An example of this is the shield evolution – which, not surprisingly, lets Hayden put up a temporary shield around him that not only protects him, but also rebounds attacks back. In a game with a HUD, you can just throw up a bar on the bottom of the screen and when that refills the player knows they can fire it off again. We had to try many different options until finally finding a way to put the indicator right on Hayden's arm."

In the end, it seems the decision gave Digital Extremes more opportunities to be creative with the game's mechanics and we hope, ultimately, with the game itself.

Extremities

With the game getting close to completion, we asked Carter what the team has learned from working on *Dark Sector*. According to the producer, it was focus testing that provided DE with the info it needed to nut out the game's finer details.

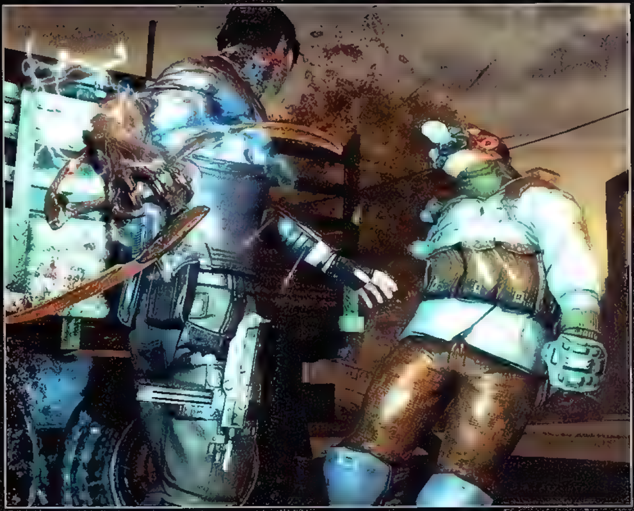
"Our game took leaps and bounds forward the day that we started doing this, and even though we all thought we started quite early at the time – I think on future games this will be something we do right from the very first prototype forward."

The focus testing also showed the glaive to be the weapon people found the most fun, and as such, it's become a crucial element of gameplay.

As you've probably guessed, *Dark Sector* will be available on the Playstation 3 and Xbox 360. As for a release date, Digital Extremes says the first quarter of this year.

What about that whole 'trilogy' thing from before? Here's what Carter had to say:

"The plan for *Dark Sector* has always been a trilogy. That said, don't expect a cliff hanger ending for *Dark Sector* – we're as sick as everyone else of seeing games... with so many loose ends. We have definitely taken the approach that each game is a complete story unto itself, which ties into the greater story of Hayden Tenno and the Dark Sector."



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A short history of DOOM

Alex Gambotto-Burke talks to Jon Romero about creating the game that started it all.

We wouldn't be here without *DOOM*. Now, I'm not about to suggest a significant percentage of the Atomic readership was inspired into conception by parents who'd just finished finally downing that pesky Cyberdemon with pistol ammo – although I won't rule it out, either – but it should be a given that this magazine, and any other like it, owes a lot to id's hairy 1993 analysis of Hell/Mars foreign policy. *DOOM* is, essentially, the locus of modern PC gaming. The gameplay model it introduced, along with the technology that supported it, fuelled the PC enthusiast market as we know it today, as well as birthing online competitive play.

DOOM was a revolution, but it would've been more a brief murmur of dissent – a *Hovertank 3D*, if you will – had id decided to go for the fast bucks. John Romero, King of Deathmatch, Progenitor of Smacktalk, and Privately Proud Father of *Daikatana* (there's a couple of hours of my life I'll never get back –ed), explains that initially, the company had planned on teaming up with Universal to make an Aliens game. "Because we were doing a game with this hugely advanced graphics engine," he recalls, "we started thinking about what would be possible with it. And Jesus, when you have a blue-sky brainstorming session like that, you can go in any crazy direction. We knew we weren't going to do any more Nazi games, so we actually talked to Universal about the Aliens license. 'Cause, you know, Aliens was all about action, and it had that scary factor that we were looking for."

Universal was down with id's plan, but Romero & Co. pulled out before Sigourney Weaver was able to become the face of the first-person shooter. Why? "We realised we didn't want anyone else to take over our creative control," Romero says, "and that was the best decision we ever made in our entire lives. We decided to create our own IP, and we said, 'Let's do our own version of Aliens.' But when we started thinking about it, we said, 'You know what? Space and aliens are too obvious – everyone expects that. What if we did demons?' Which is the opposite, you know; when you think about space, you think the future, human travel, progression, and science, and all that Christian and religious crap falling away. You assume religion's pretty much gone by the time we have space stations on Mars, so *DOOM* was about, 'What if it was really true? What if all the stuff about demons was true?' And the best demon movie back then was Evil Dead II; it was funny, and we loved having humour in our games, so it inspired us. Plus, it had some really cool weapons – killing demons with chainsaws? Hell, yeah!"

> “And the best demon movie back then was Evil Dead II; it was funny, and we loved”

It was a slightly more calculated affair than Romero's enthusiasm implies; id actually managed to touch upon something that affected everyone who crossed it. "Typically," he says, "when you think of aliens, you think of space. Everyone understands that. And religious people don't have a problem with aliens, other than that they might kill us. But the devil, hell, and demons? They go freak nuts over that stuff. It makes them go crazy, because that's their world. And anyone who's not religious, and doesn't believe in any of that stuff, just sees it as make-believe. But space is real. So you have a reasonably believable setting, and then you have these things that are mythological, but they're real in the context of the game. And that taps into everybody's belief systems on a low level. Aliens in the future aren't as compelling; having these ancient things in space is very engaging. The juxtaposition of ancient demons with a futuristic setting was totally unique."

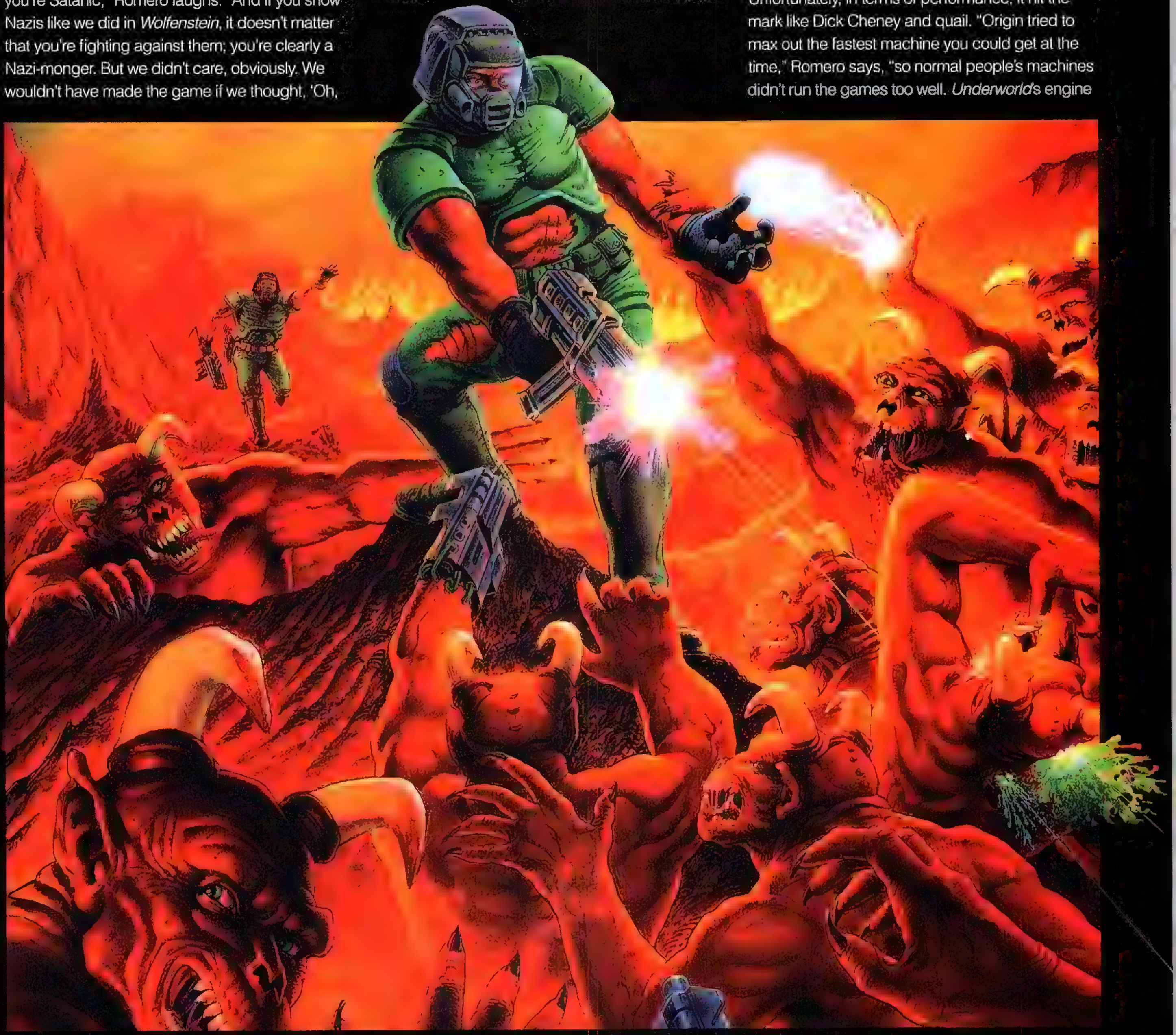
And, of course, within that setting, you were charged with eliminating all present demonoid lifeforms – this was, oddly enough, perceived by certain Christian groups in the US as tantamount to extolling the virtues of the Church of Satan. "I think that's just because anytime you show Satanism, you're Satanic," Romero laughs. "And if you show Nazis like we did in *Wolfenstein*, it doesn't matter that you're fighting against them; you're clearly a Nazi-monger. But we didn't care, obviously. We wouldn't have made the game if we thought, 'Oh, people are going to think of us badly.' We thought that was a good thing."

But does it look good?

Which isn't to say, of course, that *DOOM*s aesthetic was used solely to frighten old people. Romero genuinely cared about the unique setting his company had created, and went to great lengths to present it to the fullest. *Wolfenstein* more or less closed the book on Fisher-Price Nazism, so id's devil-worshipping staff were hankering for something a little more realistic. To achieve this, Adrian Carmack – no, for the last fucking time, he is not related to John – sculpted *DOOM*s sprites out of clay before making pixels out of them. "Adrian was an amazing artist," Romero says. "Not just on computers; he was great before he even touched a computer. And he could also sculpt stuff out of clay. So we're thinking, 'You know, we're always trying to upgrade our technology in game development, and that was so much work for Adrian and Kevin to do all those rotating sprites in *Wolfenstein*.' So we came up with the idea of taking a video camera and a model of a monster, and just rotating it through pictures.

So *DOOM* was going to look nice. But visuals have never been the only element that matters to id; speed is also a deciding factor. "That's why DOOM was so revolutionary," Romero enthuses. "No one could get a computer to render images that fast; it was pure speed. And you could do it on the machines of the day, as opposed to Origin Systems' approach, which was to max out the fastest machine available."

Indeed, Origin had published *Ultima Underworld* two years before *DOOM* hit shelves, and graphically speaking, the games were very similar. *Underworld* looked marginally better, in fact. Unfortunately, in terms of performance, it hit the mark like Dick Cheney and quail. "Origin tried to max out the fastest machine you could get at the time," Romero says, "so normal people's machines didn't run the games too well. *Underworld*s engine



386
AMMO
132%
HEALTH
ARMS
188%
ARMOR

was, in fact, more sophisticated than *DOOM*'s engine in that it did 360 degrees of freedom; you could look all around. But you couldn't see very far in front of you: there was a fairly close clipping plane. And there was also a lot of texture warping when you got near a surface. And our belief was that there was no way we could possibly release a game with visual defects. We took all the shortcuts we could to make a game that was on only one axis of view, and we kept it simple. And in keeping it simple, that enabled us to do some awesome code optimisations to make it go extremely fast."

Zombie wardrobes

Curiously, it wasn't code optimisations or asset creation that provided the main challenges to *DOOM*'s development; building *DOOM* was a relatively straightforward task. What caused serious problems, however, was level design. "We were so from the *Wolfenstein* mindset of 'a floor, a ceiling, and lots of ninety-degree corners'," Romero remembers, "and when we started doing *DOOM*, that was much harder because there was so much more information to put in there. But then I was like, 'This is not it. We have to push for something cooler.' So I started coming up with the idea that if it isn't in the first little room, then they must soon come to an area that just looks great. Maybe a huge room, or a place that's really amazing where you can see through a lot of windows. My vision was, 'We need a whole lot of cool areas. If we try to design levels like that from the start, further good design will flow from that.'"

"We weren't taking advantage of what we could do with the new engine, so I worked really hard and finally came up with this new feel of how big the room should be, and how there should be contrast in lighting, in size, and in gameplay. So you'd go from a big, bright room, to a dark, cramped hallway, and you'd have a small fight with some monsters, and then a massive fight. It wasn't the same trickle of monsters throughout the level. It was all about contrast. I just wanted to make something that was really interesting to move around in, and that was scary, and that could pull all those surprises on the player, but also provide really cool vistas. You'd see these really cool, scenic areas that you'd look at and go, 'That's awesome.' And we were just trying to use the engine in any way we could without doing any kind of sector hacking. Without doing hacking I was trying to create levels that were interesting to think about and move around in; they weren't just flat."

Monster placement and architectural improbabilities weren't Romero's only innovations in the level design department. He also implemented – to great effect in *DOOM* but a detriment to pretty much every other FPS ever made – the infamous "monster closets". These are where you'd happily traverse a relatively clear section of a level, only to pick up the red card and have 100 enemies burst out of the walls behind you. Romero found the little things like this relatively easy. "That was kind of basic," he says. "It was so easy just to put a little line death in a little room there, and then you just put some monsters in, and try to make the door open and go, 'Yeah.' And I kind of came up with a bit of similar functionality in *Quake*, because *Quake*'s engine was more capable of making the levels I wanted. I put in a small bit of functionality in *Quake*'s engine, because it was way more work to make the levels I created. But I made a thing called a func_door, which is an entity in the code. And you could stick this door somewhere and it didn't matter. *Quake*'s designers were being careful in regard to putting something in there, because it was so much work."

Player vs Player

The threat of monster closets, however, paled in significance to the danger of other, real, flesh 'n' blood 'n' caffeine players posed to you. And in *DOOM*, fear of such was entirely justified – it was, after all, the first multiplayer FPS. Oddly enough, though, it almost wasn't; multiplayer functionality was added on at the eleventh-and-a-half hour.

"It was added on later," Romero admits. "When we put together our press release in 1993, multiplayer was on the list of features that we were going to be releasing. And we actually said in the PR that it was going to be the craziest deathmatch ever. When we were developing the game, though, we weren't developing the levels for multiplayer. And then it got to be about a month before release, and we were trying to wrap everything up, and we thought, 'Oh, man! We forgot about that multiplayer thing! We'd better put it in there.' And it took Carmack less than a week to write all the code for serial modems and LANs. He got linked up, and when we got to see what the game looked like, it was mind-blowing. We quickly came up with rules for it – I coined the term 'deathmatch' at that point – and stuck in player starting points, and all that sort of stuff."

Romero will never stop thanking *Cthulhu* for reminding him to get the team to create multiplayer code, because it's still his favorite videogame experience. "I still play multiplayer *DOOM* almost every night," he laughs. "My two boys are 18 and 19, and we just do insane deathmatches – and we scream. The other night, we were playing, and I was pounding my desk so hard that this giant, glowing light thing just fell and blew into a million pieces – glass everywhere! I love the fact that it's

243
AMMO
156%
HEALTH
ARMS
146%
ARMOR

31
AMMO
101%
HEALTH
2 3 4
5 6 7
ARMS
100%
ARMOR
BULL 195 200
SHEL 31 50
RCKT 0 50
CELL 0 300

super fast, and the weapon balance is so great. Also, it's on one axis, so you don't have to aim up and down; you just have to worry about your horizontalling. The sound cues, too: the feedback is great; the screaming, the blood, the sound of a double-barreled shotgun blasting really hard into someone's face ..."

Online *DOOM* wasn't just about shooting other people until they're no longer alive, though; players also started tweaking the game to create new experiences, thus birthing the mod scene. "That was huge," Romero enthuses. "I don't think you could even calculate how much of an impact opening *DOOM* up to modders had; it not only kept the game alive, but it also reinvigorated the industry, because you had all these people that were intensely interested in spending time modding. And because they were so interested in that, they became game designers, got jobs in the games industry, and continue to push games forward."

That said, *DOOM* wasn't the first game that attracted the Victor Frankensteins of the gaming world – *Wolfenstein 3D* attracted its fair share of tampering, too. "With that game," he explains, "we used a modified version of Huffman compression. And if you're using Huffman compression, you say 'Huffmanize'. So, you know, 'Are you going to Huffmanize those files?' And Carmack made changes to the Huffman compression, so we called it 'Carmasize'. So, all the levels in *Wolfenstein* were Carmasized, and they were compressed using an algorithm – the modified version of Huffman – the key of which was actually linked and compressed within the executable of the game. So it was not easy to decompress those *Wolf* files, because if you just look at them, there's no way you can decompress them. You need the dictionary required to decompress them, or they won't make any sense."

But those crazy *Wolfenstein* fans found a way. Romero was astonished. "They found the dictionary," he recalls, "and they figured out how to reverse-engineer the compression scheme, and they were basically making new maps. They were taking the maps we had, decompressing them, programming editors to make new maps, and then recompressing them back to the original format. And it was not an easy thing, and once we figured that out, we thought, 'Oh my god, look at what these people are going through just to create levels! We need to make *DOOM* completely open, so they can focus on the fun stuff, which is the map creation, rather than the cracking.' So, by keeping *DOOM* open, we basically told them, 'Hey, have fun.'"

Pre-viral marketing

Much of this wouldn't have occurred, though, had *DOOM* not been sold in such an innovative way. Word-of-mouth powered *DOOM*'s early success,

97
AMMO
142%
HEALTH
2 3 4
5 6 7
ARMS
185%
ARMOR
BULL 400 400
SHEL 97 100
RCKT 33 100
CELL 40 600

276
AMMO
90%
HEALTH
ARMS
177%
ARMOR

***DOOM* doesn't really need captions... but, hey, look, a caption!**

and then id gave some very clever orders to retailers. "We made some unheard of before-or-since changes to the traditional shareware model with *DOOM*," Romero proudly says. "What we added was that we put it up the same way, but then we told all of the vendors – CompUSA, for instance – that if you take *DOOM* and you put it in a box, and you put it in CompUSA for ten bucks, you keep all the money. We didn't want any of the money; we just wanted them to keep the box in the store. So all these vendors started making their own version of the *DOOM* box, and it was the first and only time I've ever seen ten different-looking boxes of the same game on store shelves."

id's strategy paid off beautifully, and Romero's a little disheartened that no one's tried it since. "People just don't have the same philosophy id had," he sighs. "Too many people are out there just trying to make that dollar, rather than just trusting the consumer to pay for what they think is quality, and knowing that what you're creating is the highest quality. And if you put it out there, you're confident you'll get the right response. And you can survive off that. Too many developers don't have the confidence we had to release something, knowing it's the greatest thing."

It clearly was, because not too long after *DOOM* hit shelves in its multitude of incarnations, players had thoroughly consumed everything *DOOM* had to offer and demand for a sequel began to mount. And, in October, 1994, the demon-battling legions of *DOOM* faithful were rewarded – *DOOM II: Hell on Earth* hit shelves. It wasn't a remotely innovative step in id's history – *DOOM* and *DOOM II* were more or less identical, save for the new missions, several new monsters, and the admittedly flawless double-barreled shotgun. But then, *DOOM* was, in many ways, the perfect story-free FPS. So, why mess with gaming Elysium?

In any event, *DOOM II* was never about shaking things up – that was *Quake*'s business, and that was a year off. *DOOM II* gave players exactly what they wanted – 30 more expertly designed levels, and a few surprises. In bestiary terms, the Arch-Vile is probably the most notable addition – it gave sane players a small taste of what playing through the game on Nightmare difficulty would be like, by raising fallen foes not long after they'd been dispatched. If there's one criticism that can be levelled at *DOOM II*, it's probably that id tried to overstep the limitations of their engine at certain points. Levels that were set in real-world locations often looked bizarre; the *DOOM* engine simply wasn't capable of producing convincingly realistic areas.

> **"Had I done *DOOM 3* I would have done something very different."**

Unsurprisingly, though, *DOOM II* went on to become id's highest-selling game at that point, reaching around two million souls. Appetite for id's hellish sci-fi adventures didn't wane, though, so id began commissioning independent level editors to produce an expansion pack, *Master Levels for Doom II*. This was quickly followed by *Final Doom* in 1996, which was an independently-produced set of two 30-level "megawads". 60 levels strong, *Final Doom* did manage to live up to its namesake – id didn't publish or develop any further games using the *DOOM* engine.

One of Romero's biggest gripes about the id Software of today is that, after *Quake*, they seemed to follow the above pattern – just update franchises, rather than work on new material. The company had seemingly exhausted the *DOOM* franchise by 1996, but FPS fans across the globe began salivating when Carmack dropped the hint that *DOOM 3* might be around the corner, in 2000. When the game – supported by Carmack's latest, greatest engine – finally appeared in 2004, most were enraptured, at least initially. The game was dark and intense, and easily matched its predecessors in the carnage stakes. It was, basically, DOOM '04; exactly what you'd expect. Therein was the problem, though, according to Romero. "I remember hearing during development of *DOOM 3*," he somewhat disdainfully recalls, "that they were just trying to redo *DOOM*; that they were trying to retell the story, and wipe it away for some reason. And that was ludicrous, because there's no way you're making everyone believe the original *DOOM* never happened. So that was ridiculous. And the story? I don't understand why they didn't continue on from *DOOM II*."

"Had I done *DOOM 3*, I would have done something very different. I mean, one of the most important things id has done wrong since *Quake II* is that they haven't paid attention to their franchises, and how they blend together. Internally, they make these games, but they don't think about how they all overlap. They just slap different names on the boxes. You look at *DOOM 3* and *Quake IV* ... It's the same game. You wouldn't be able to tell the difference. It's made using the same tech, the same bio-mechanical monsters, and marines. It was all the same thing. Back when I was there, the philosophy was, 'Next game, we do something different.' It's its own IP; it's its own brand."

You can't really fault Romero for his indignation. After all, the *DOOM* that made id what it is today seems to have been lost in the constant struggle for better technology. This isn't just from a design perspective; as Romero mentioned, *DOOM* was all about trust: trust in the flawlessness of the game, and trust in players to know quality when they saw it. And when they did, Romero knew his game would take over the world. "When people were calling the office on random extensions to find out when *DOOM* would be released, that was a sign. When we were trying to upload the game but couldn't get on the server because everyone was waiting for it, that was another sign. When the server crashed twice because of the high demand, that was yet another sign. And then, when for the rest of the year, pretty much every single games magazine talked about *DOOM* in various ways – articles comparing *DOOM* to other games, pieces on *DOOM* addiction and nightmares about the game – I knew. I'd never seen one game take over people's minds so completely."

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Rainbow Six Vegas 2 [Preview]

They've got the stupidest name in global counter terrorism, but they're still kicking butt. **David Hollingworth** signs on.

Rainbow Six Vegas was quite the departure for the Rainbow Six franchise. It ditched the strategic planning layer of previous games, and upped the run-and-gun factor. Die hard fans had bit of a whinge, but the change paid stupidly huge dividends. A series that had been critically acclaimed but that could be a chore to play (I mean, really, who likes spending a half hour plotting your entry to an estate only to be twitch-killed five seconds into the mission) became more approachable and still managed to impress reviewers with its slick single player and tight online play.

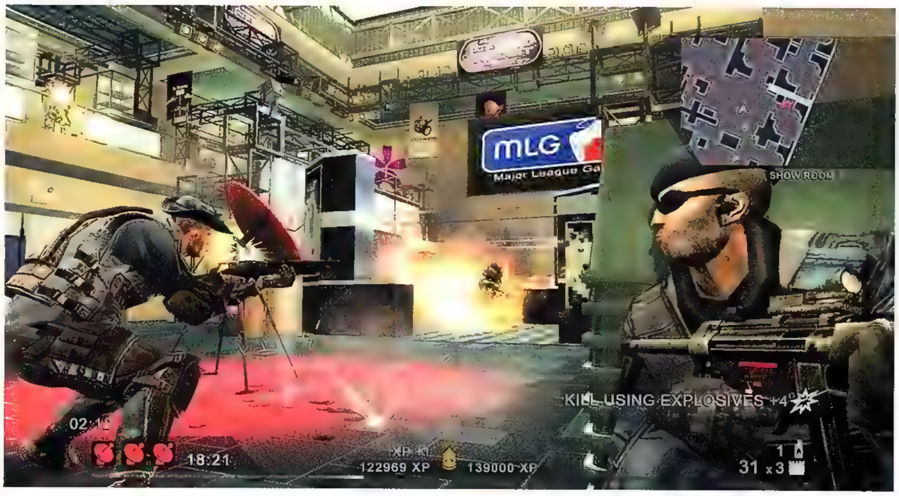
It should come as no surprise then, that the core gameplay of *Rainbow Six Vegas 2* has changed very little. It's still a semi-stealthy shooter, with enough nods to realism and tactics to keep the gun nerds happy, while still being actually fun to play.

But what the new game does add is a lot more depth and customisabilty. To begin with, you no longer play Logan Keller, but a fellow (or lass) called Bishop; you get to choose your appearance, as well, straight away in the single player game. Further, like many modern games, such as *Call of Duty 4*, the game implements an experience point system to unlock weapons and equipment. In a departure, though, you take this identity, and your XP and gear, across both the single-player and the multiplayer elements.

We've not had a chance to mess around with online code, but single player code we got. *Vegas 2* does feel lot more like an expansion than an entirely new game, but that's not necessarily a bad thing. You take your team on a mission, point them at cover, bad guys and doorways, and things get hidden behind, shot in the face or opened up to have an explosive device lobbed through them.

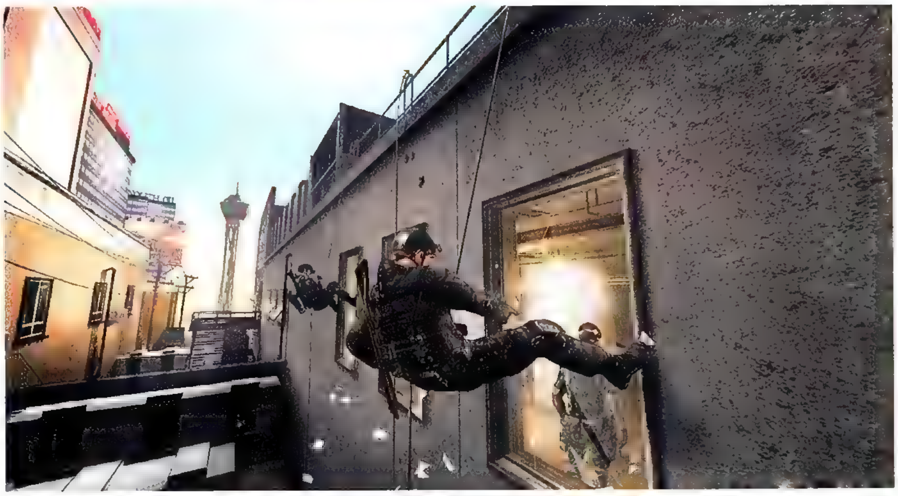
The game, even in this less than final build, still presents some great sequences, and looks and sounds great. In particular, the pacing of encounters is excellent; you'll spend time sneaking, then burst into a room in a quick spray of fire, then advance some more, and maybe trigger a rush of enemies through a chokepoint, before you have to get into a room despite it being defended by well entrenched badguys who have an even better idea than you of what is and isn't cover. New toys like smoke grenades and thermal satellite scans allow for some great tactical play, and team AI has also been tweaked – you can actually rely on your team-mates now, and they get themselves shot a whole lot less.

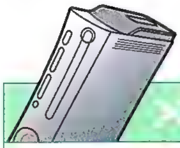
It's the extras, though, that make *Vegas 2* worthwhile, though it remains to be seen how much of an impact it will have on entire battalions of *CoD4* fans.



The two big changes are, of course, the Persistent Elite Creation system, which earns you improvements for both on and offline play, and the ACES system, which tracks how you like to play and rewards you appropriately. It's essentially another layer of XP, and in practice it seems to work well, at least in the single player build we've looked at. If you like popping terrorists with headshots from across the map, you earn Marksman points; sneak up on the same deadman walking and pop him from behind, and you get CQB (Close Quarters Battle for the non gunheads) points; lastly, blowing shit up with grenades and killing every bad-guy in a single spray of fire gets you Assault points. Earning XP advances your rank and unlocks gear and clothes, meaning as you progress through the campaign Bishop gets to look more and more badass with every mission, but it's ACES points that get you the big guns, and the right guns for how you like to play.

We're very much looking forward to seeing some multiplayer action, and of course the final build, some time soon, but there still seems a long way to go. Load times are long, and texture drop in is rampant, but that should all be ably done away with by simple optimisation of what is looking to be a sturdy successor to a great shooter.





Developer **Ubisoft Montreal**
Publisher **Ubisoft**
Website **http://www.rainbowsixgame.com/**
Other platforms **PC, 360, PS3**

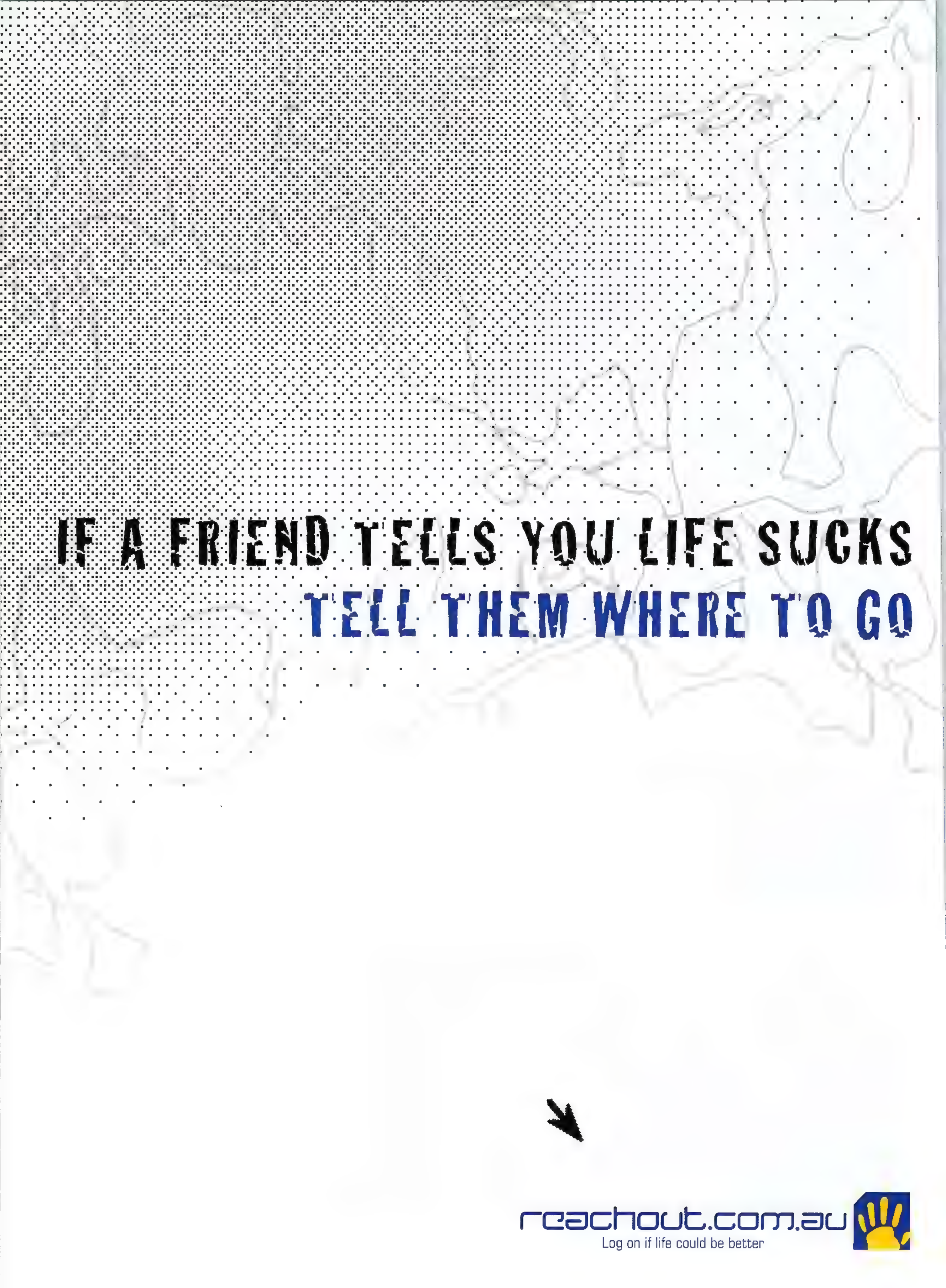
VERDICT

Excellent gunplay; workman-like AI; PEC and ACES systems. ✓

Not exactly groundbreaking; some issues to be resolved before final code. ✗

ANTICIPATION RATING

8.0 OUT OF 10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Everything you need to know about geek film, music and literature.

Gang Leader for a Day

Gang Leader for a Day

BOOK Author: Sudhir Venkatesh
Publisher: The Penguin Press

After three years of studying what amounts to a bastardised Bachelor of Arts, yours truly has developed quite a dislike for those serious academic types. Typically, their works on the poor and downtrodden are awfully disrespectful. The writer usually adopts an air of superiority, portraying the poverty-stricken as completely hopeless, helpless and pitiful—folks to distance oneself from, to observe like fish from behind plate glass. So refreshing is it, then, to crack open a book on this topic and, in the first chapter, witness the author come to terms with how distanced the ivory tower of social science is from the people it purports to help. *Gang Leader for a Day* tells of Sudhir Venkatesh's decade-long project on the Robert Taylor Homes – one of the largest and most notorious public housing estates in Chicago. Early in his research, Venkatesh meets JT – an officer in crack-selling gang the Black Kings – who serves as guide and mentor during Venkatesh's time in the neighbourhood. The friendship that develops between these two young men forms the core of the story. Works on the US' urban poor tend to have a limited audience. But, like David Simon's works – *The Corner*, *Homicide* and the HBO drama *The Wire* – *Gang Leader for a Day* is presented in such a way that anyone can pick it up. The story is incredibly compelling, populated by some of the most amazing and engaging personalities ever to grace the printed page. By opting to ignore his field's love of stats and 'wide lens' research, Venkatesh has done something absolutely incredible. Definitely worth the import from Amazon. **CT**

score **9.5** OUT OF 10

Underbelly

TV Starring Vince Colosimo, Robert Mammone

When we heard Channel 9 was doing an *Underbelly* series – based on Andrew Rule and John Silvester's books of the same name – we were concerned. Forgive us for being unpatriotic, but Australian dramas are, for the most part, truly and utterly shit. On a sort of Biblical plague level. Consider *Sea Patrol*, for example. Ugh. One of our main fears was that, like so many Australian shows, *Underbelly* would be too clean. We had no doubt that'd be violent, but we feared they'd tone down the language and such. Making it suitable for the 8:30 slot. That fear, at least, wasn't realised. *Underbelly* had potential. The books were very accurate in their depiction of the war that engulfed Melbourne's underworld. There were personalities that, if handled correctly by the scriptwriters, could've made for some of the most compelling and engaging characters to ever appear on Australian television screens. Sadly, *Underbelly* falls apart in that it was only intended to have a 13-episode run. That meant there was no time for the writers to develop characters into more than violent, sleazy cartoon-ish versions of their real-life counterparts. The performances are a mixed bag. Certainly Williams and the Moran brothers are portrayed well, but some of the casting seems a bit odd. Kevin Harrington – who you've maybe seen in *SeaChange* and *The Dish* – just doesn't fit as Lewis Moran. The presentation is weak, too. The editing is poor, the soundtrack is too in-your-face, the camerawork horrendous. It's truly disappointing to see just how badly Channel 9 has butchered what could've been one of the best crime series ever. **CT**

score **4.0** OUT OF 10

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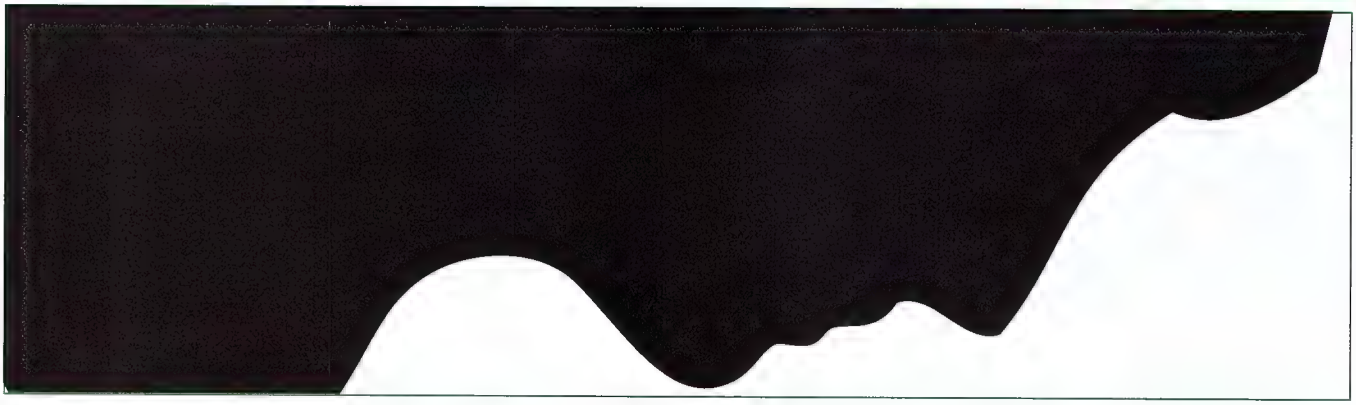


Virtue and virtuality

Zara Baxter puts the classics back into classic games.

The Game Developers Conference in Vegas is a place where magic happens. Not the kind of magic that involves Disneyland, clapping your hands and fairies, but the kind that involves tiny startup indy game developers making out like bandits if they come up with an awesome design.

Take *Narbacular Drop*, a little game produced by Nuclear Monkey Software for the 2006 Independent Games Festival. A student entry, it featured, "a fantasy setting, where the player navigates a dungeon with two interconnected portals. The dungeon has a series of traps and puzzles, which the player must solve by moving around objects in the environment using the portals." Sound vaguely familiar? If so, you've probably played *Portal*, Valve's immensely popular game, which started out life as *Narbacular Drop*. If you haven't, you really should.

The Independent Games Festival, which happens as part of GDC, is where all the little games get picked up by big name studios. This year's winners included *Globulos.com*, in the Web Browser Game section, which promises "a multiplayer multigames environment where the games share the same core game mechanic for arcade, fun and strategy," and *Gesundheit!*, which contains awesomely gross "Evil booger-eating monsters" whose only weakness "is their love for delicious nasal discharges." Mmm.

> **"And you just know our Shakespeare MMO would be a hotbed of boys playing girls and girls playing boys..."**

That made me think about the kind of games that don't exist, but probably should. A couple of bottles of wine, a few friends, and a weekend later, we came up with a few.

Our primary aim was that it should fill a niche nobody had yet covered. Such as school students who'd rather not have to slog through required reading for English courses. Bored housewives. Gaming Widows. (Okay, so the latter two have *Peggle*, but that just proves my point, really.)

Once we started thinking about it, we wondered why no-one else had developed it: *The Jane Austen Video Game*. Think period RPG, with all the avatar generating and costuming that entails, add a smidgeon of The Sims for micromanagement, the dancing sequences from Pirates! and the saucy bodice-ripping of Japanese dating games.

First you'd choose your character class. Opt to be a 'Rake' and your missions will be filled with seductions and intrigues; we suggest Wickham as a name, but you may opt for something more Barbara Cartland. Roger is a nice traditional alternative with salacious undertones. Select 'Youngest Daughter' class and you're likely to face years of frustration as you desperately try to matchmake your older sisters off to wealthy barons to improve your own chances of hot wedded lust and a life of comfort and small white laptops. Er, lapdogs. You could try your hand at scandalous goings-on, or try to get adopted by a Family of Note. Other options might include 'Single Man in Possession of a Fortune', 'Spoiled Heir', 'Dowager Duchess', 'Oh, an Officer!' or 'Young Lady of Wit but no Means'.

Character in hand, you'll face the rigor of costuming. No young gentleman or gentlewoman can be without morning dress or suit, evening wear and ballgowns, the right gloves, hats, boots and other accessories. Be honest, who hasn't desired a +2 fobwatch of cad-smacking?

The way we envisage it, it would have even more costume options than Diablo 2, not to mention more jewels.

Last but not least, you choose your setting. Would you prefer a tiny village in which you can micromanage the lives of a grateful populace, performing such machiavellian machinations as acquiring the Governess a new Pianoforte and persuading the old maids to throw a garden party? Or would you rather have the anonymity of a Great City, such as Bath, where the forums provide more scope for trouble-making and assignations.

We'd probably need Sid Meier as a consultant on the whole thing, but it should be ready in time for next year's IGF. He can't be that busy these days, right?

It doesn't end with Jane Austen, though. We at Classy Classics Games have follow-up titles to take us through to 2010. Our concept for Dickens – Fagin, the pickpocketing and assassination game – should be a winner.

And you just know that our Shakespeare MMORPG would be a hotbed of boys playing girls and girls playing boys; mistaken identity, kings, quests, snark and poison galore. Kinda like WoW, only with fewer elves, which can only be a good thing (you can never have enough elves *–ed*).

If you'd like to join our franchise with a sizzling hot classic conversion, outline your concept in an email zbaxter@haymarketmedia.com.au

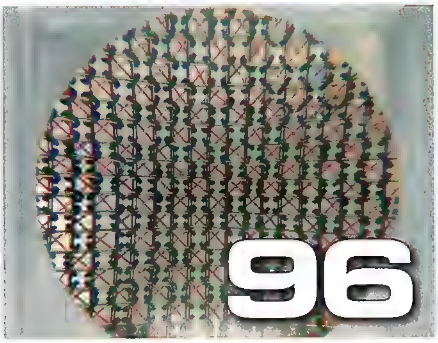
TECHNIQUE

HANDS-ON TUTORIALS FOR THE TECHNICALLY INCLINED

What a varied catch we have for you this issue. Leigh Dyer gets his game on with an installation guide to Wine that will have those looking for way out from under the Windows gaming monopoly cheering heartily. Ron Prouse also finishes up his latest build – if you thought his cooling tower was looking a little… rough at the end of the first part of the tutorial, you're in for a surprise. This thing looks good.

We're also expanding the Atomic.edu section this month, with more words of advice from Chris Taylor than ever. This time he talks up the pleasures and diversions of university life, and why you should do your best to ignore them!

Finally, Dan Rutter helps out some readers with their tech issues, and Logan Booker wraps things up nicely – as only he can.



TECHNIQUE CONTENTS

Installing Wine 84
Make the most of this excellent emulator and play some of the hottest games on PC without having to go near a Windows box. Neat!

Cooling Tower Build pt2 88
It's time to finish the, er, build. And Ron does just that, adding lighting, dials, switches and other cool stuff to his cooling tower.

Atomic.edu 93
Chris Taylor wants you to stay the hell away from the campus bar. No, really.

IO 96
It's chock full of helpy goodness. And Dan Rutter.

Fallout 98
Logan's last words. Wait, not his *last words*, his… you know what we mean.

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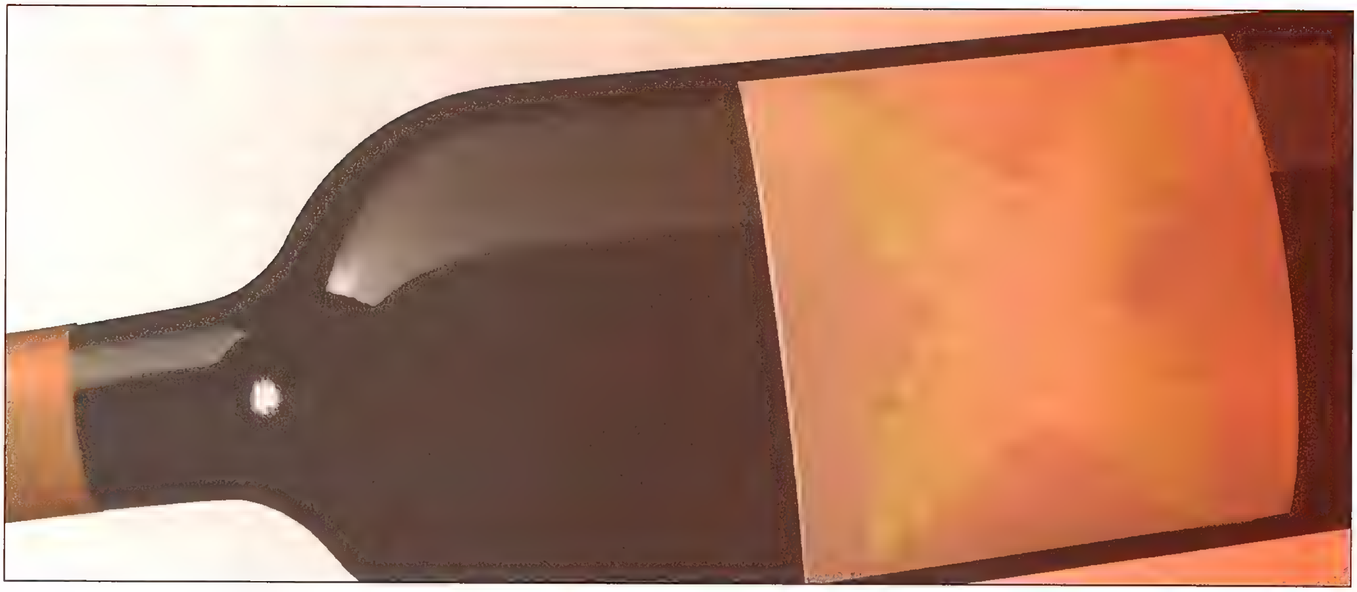

DIFFICULTY **INTERMEDIATE**

Installing WINE

Leigh Cook takes us through the task of installing Wine. And he doesn't spill a drop!

In our Linux gaming feature a couple of months ago we looked at Wine, the Windows compatibility layer that allows Linux users to run a number of Windows games, including recent hits like *Team Fortress 2* and *Call of Duty 4*. It's not the easiest thing to set up – not by a long shot, in fact – but that's why we're here. We'll show you what Wine can do, how to get it working, and how to get the best out of it.

Removing the cork

The easiest way to get started with Wine is to install your distribution's packages – 'sudo apt-get install wine' would do the job on Ubuntu, for instance. However, with the rapid pace of Wine's development, these packages might be a few versions old. A good alternative is to use the official packages from the WineHQ download page (**http://www.winehq.org/site/download**), which are typically updated within days of each new Wine release. For most distributions, these are provided as repositories that you can add to your package manager, so you can easily keep up with new releases automatically.

Once it's installed, you can run Windows .exe files by either double-clicking on them, or by running them at the command-line with the 'wine' command. For instance, if you have your Windows install handy, you could go to your 'windows/system32' folder and run:

```
wine sol.exe
```

Wine stores its data in the '.wine' folder in your home directory, which is created the first time it's run. Under this, there's a 'drive_c' folder, which contains the contents of your virtual Windows system – any applications running under Wine see this as your C: drive, so it contains your 'windows' and 'Program Files' folders, among others.

Installing software under Wine is much the same as under Windows – just run the installer and step through. The files will be stored under your '.wine/drive_c' folder, and on most distributions if the installer sets up shortcuts they'll appear on the desktop or under your desktop menus. Alternatively, you can go in to your '.wine/drive_c' folder and run the applications manually by double-clicking or using the 'wine' command.

For some games and applications, that's all you need to do, but others will take a bit of tweaking. The best place to go for compatibility information, including the details on any tweaks required, is the Wine Application DB (**appdb.winehq.org**), but we'll walk you through a few examples.

Vampire The Masquerade Bloodlines
ufo Afterlight
$29.95
Universe at War Earth Assault
$49.95
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Is it getting Steamy in here?

Steaming open The Orange Box

Valve's games are the perfect starting point for jumping in to Wine: the Source engine runs well on Wine's DirectX implementation, and using Steam gets around any disc-based copy protection issues. Follow these steps to get your Steam on:

1) Install the Gecko-based replacement for the MSHTML component, which Steam needs to render its internal web pages. It's meant to install automatically when first requested, but this doesn't always work with Steam, so it's best to run Wine's built-in 'iexplore' command instead:

```
wine iexplore http://winehq.org/
```

Close the browser window once the installation is complete.

2) Go to **http://steampowered.com/** and download the Steam installer. Because it's an MSI file, you need to launch it using Wine's built-in MSI handler:

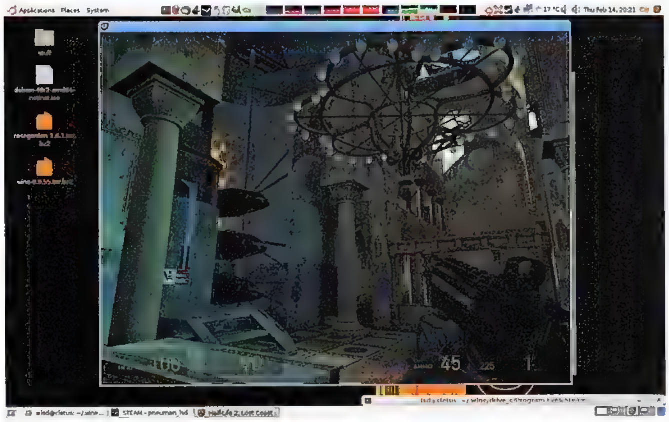
```
wine msiexec /i SteamInstall.msi
```

3) Step through the installer just as you would under Windows. When it's complete, Steam should run automatically, but if not, you can launch it manually from Wine's virtual C: drive:

```
cd "~/.wine/drive_c/Program Files/Steam"
wine Steam.exe
```

4) When Steam launches, log in to your account, and the main Steam window should appear.

Your existing purchases should be listed in the 'My games' tab as 'Not Installed', so you can re-download them for free. Alternatively, you can save yourself the bandwidth by copying the 'steamapps' folder from the Steam folder on your Windows drive to your new Wine Steam folder. Re-launch Steam after the copy, and your games should be ready to play.



Wine loves Source engine games, like *TF2*, *HL2*, and *Portal*.

Everything in *The Orange Box* should work without tweaking, though you may hit some performance snags or graphical glitches when using DirectX 9 features. The Source engine is nice and scalable though, so you can force games to run in DirectX 8 mode if required: just right-click on the game in the 'My games' tab, select Properties, click the 'Set launch options...' button, and enter '-dxlevel 81'.

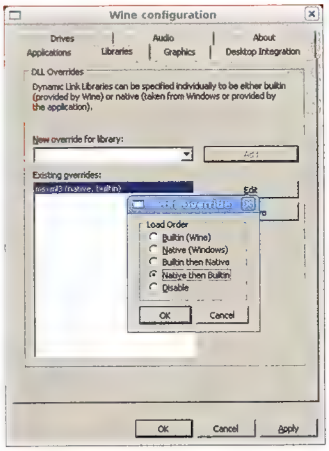
Wine configuration

All good Linux tools are loaded with options, and like the blood in an anime character, Wine is filled to bursting point. The first port of call is, unsurprisingly, the Wine configuration tool, 'winecfg':

```
wine winecfg
```

Some of the key settings include:

- Setting the version of Windows that Wine reports itself as, under the 'Applications' tab. You can set this on a global or per-application basis. This can be handy for getting specific applications running – 3DMark05, for instance, works with the 'Windows 98' setting, but not the 2000 or XP settings.
- Audio acceleration options, in the 'Audio' tab. Many games only work when the 'Hardware Acceleration' option is set to 'Emulation', so try this if you have any in-game sound issues. It's also best to pick one sound driver API to use (ALSA, generally), and disable the others.
- The 'Enable a virtual desktop' option, in the Graphics tab. This creates a single window on your desktop that all of Wine's windows sit inside, which can help avoid window management issues with some applications. It's also great for troubleshooting full-screen games, since the game is limited to the virtual desktop window, giving you full access to any Wine error messages.
- DLL override options, in the 'Libraries' tab. Some of Wine's built-in DLLs can be replaced with the original Windows versions for improved compatibility, but to use them, you need to add a manual override for the specific DLL involved. *Civilization IV* is a good example – you need to install a genuine 'msxml3.dll' file in to your 'system32' folder and add a DLL override to get it running.


Wine configuration
Drives
Audio
About
Applications
Libraries
Graphics
Desktop Integration
Add
Edit
OK
Cancel
Apply

DLL Overrides

Dynamic Link Libraries can be specified individually to be either builtin (provided by Wine) or native (taken from Windows or provided by the application).

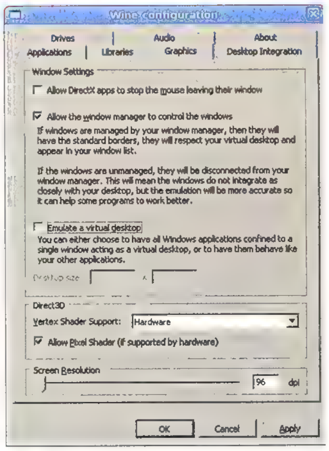
New override for library:

Existing overrides: msxml3 (native, builtin)

Load Order

○ Builtin (Wine)
○ Native (Windows)
○ Builtin then Native
● Native then Builtin
○ Disable

The 'virtual desktop' is great for troubleshooting.


Wine configuration
Drives
Audio
About
Applications
Libraries
Graphics
Desktop Integration
OK
Cancel
Apply

Window Settings

☐ Allow DirectX apps to stop the mouse leaving their window

☑ Allow the window manager to control the windows

If windows are managed by your window manager, then they will have the standard borders, they will respect your virtual desktop and appear in your window list.

If the windows are unmanaged, they will be disconnected from your window manager. This will mean the windows do not integrate as closely with your desktop, but the emulation will be more accurate so it can help some programs to work better.

☐ Emulate a virtual desktop

You can either choose to have all Windows applications confined to a single window acting as a virtual desktop, or to have them behave like your other applications.

Desktop size x

Direct3D

Vertex Shader Support: Hardware

☑ Allow Pixel Shader (if supported by hardware)

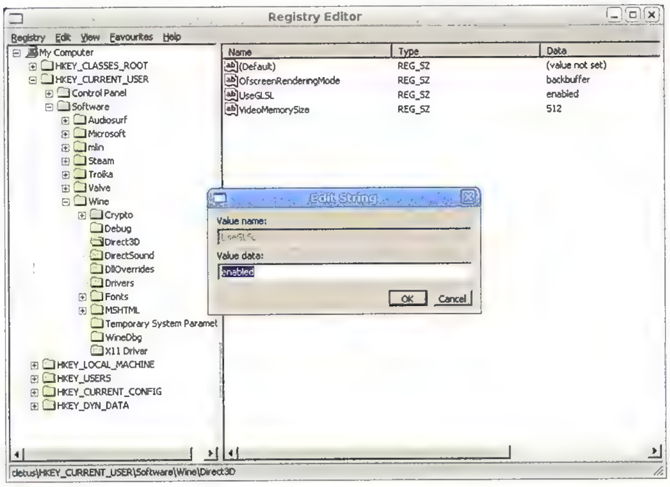
Screen Resolution 96 dpi

Use DLL overrides to add native libraries.

You can find further options in the registry, which you can edit using Wine's built-in version of 'regedit':

```
wine regedit
```

For instance, if you're happy running Source engine games in DirectX 8 mode, you can improve performance by disabling Wine's DirectX 9 shader support and using the older, but more heavily optimised, DirectX 8-only shader code. To do this, use 'regedit' to set the 'HKEY_CURRENT_USER/Software/Wine/Direct3D/UseGLSL' to 'disabled'.


Registry Editor
Registry
Edit
View
Favourites
Help
My Computer
HKEY_CLASSES_ROOT
HKEY_CURRENT_USER
Control Panel
Software
Audiosurf
Microsoft
mlin
Steam
Troika
Valve
Wine
Crypto
Debug
Direct3D
DirectSound
DllOverrides
Drivers
Fonts
MSHTML
Temporary System Paramet
WineDbg
X11 Driver
HKEY_LOCAL_MACHINE
HKEY_USERS
HKEY_CURRENT_CONFIG
HKEY_DYN_DATA
Edit String
OK
Cancel

Name	Type	Data
(Default)	REG_SZ	(value not set)
OfscreenRenderingMode	REG_SZ	backbuffer
UseGLSL	REG_SZ	enabled
VideoMemorySize	REG_SZ	512

Value name: UseGLSL

Value data: enabled

cletus\HKEY_CURRENT_USER\Software\Wine\Direct3D

Wine really captures the true Windows experience.

Home Wine-making

To get the best from Wine, building it from source is the way to go. It's a little more complicated than installing packages since you need to install all of the libraries that Wine depends on before it'll build, but it's quite straightforward after that, and it's a great way to give multi-core CPUs a workout.

1) Install the development packages required for building Wine, which includes the libraries and headers for X, OpenGL, ALSA, libjpeg, libgif, and libXML, among others. On Ubuntu, there's a great shortcut for this using APT, since by default it tracks the build dependencies for each package. This means that you can install all of the build dependencies with one command:

▲ **Disappointment: *COD4* is not a sequel to Amiga classic *RoboCod*.**

```
sudo apt-get build-dep wine
```

2) Grab the latest Wine source code archive from the WineHQ download page, extract its contents, and change in to the newly-created directory:

```
tar jxf wine-0.9.55.tar.bz2
cd wine-0.9.55
```

3) Configure and build the source:

```
./configure --prefix=/usr/local/wine
make depend
make -j3
```

The '-j3' option specifies the number of threads to use while building. This should be one more than your number of CPU cores to ensure that each core is always kept busy, so '-j3' is perfect for a dual-core CPU, while '-j5' would be best for a quad-core system.

4) Install the compiled copy of Wine:

```
sudo make install
```

Rather than overwriting any packaged versions of Wine you have installed, this version will be installed under '/usr/local/wine'. This folder won't be searched for executables by default, so you'll need to either specify the full path to the Wine executable when running it ('/usr/local/wine/bin/wine'), or add this folder to your path, so that running 'wine' will find the new version:

```
export PATH=/usr/local/wine/bin:$PATH
```

You can add this to your '.bash_profile' file to permanently modify your path.

There are two main benefits to building from source, and the first is the ability to handle regressions. Wine is an incredibly complex product, and there are often times when a change in one part of the code can have unintended consequences elsewhere, or when a new implementation of something that may be an overall improvement is weaker in particular areas than the old version. In either case, you can get situations where a game that ran well with an earlier version of Wine runs poorly, or not at all, on the latest version, which is particularly annoying when the latest version includes fixes for other titles.

By building from source, you can have multiple versions of Wine installed simultaneously, simply by changing the prefix used in the './configure' command for each installation. For instance, you could install each version in to its own, version-numbered folder:

```
./configure --prefix=/usr/local/wine-0.9.55
```

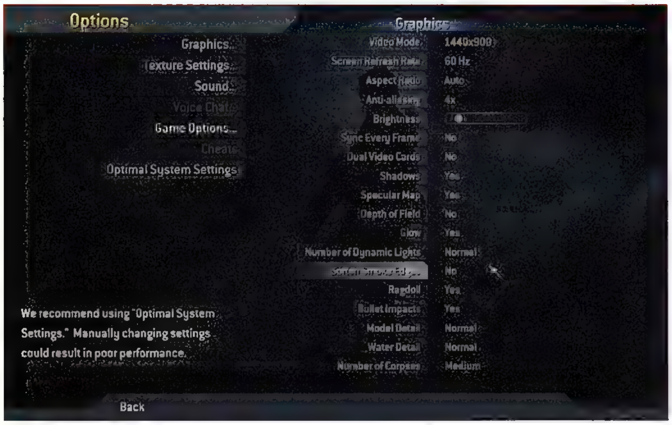
To help manage this, you can use a symlink to point '/usr/local/wine' to the most compatible version of Wine that you have installed:

```
cd /usr/local
sudo ln wine-0.9.55 wine
```

This way, you can run 'wine' as normal for the most part, while still having the flexibiltiy of using the full path to specify exactly which version to run when needed. Each time you install a new version of Wine, you can make the new version the default by updating the symlink, and if you run into problems, you can point it back to the previous version just as easily. The only catch is that you can't actually run multiple versions of Wine simultaneously, so you'll have to close down any applications running on one version of Wine before you can launch any with another.

Patching and *Call of Duty 4*

The other benefit to building from source is that you can patch the code to fix specific issues. Some games fall just short of running under Wine because a specific feature is missing, and in some cases, developers have put together quick fixes that



Video Mode	1440x900
Screen Refresh Rate	60 Hz
Aspect Ratio	Auto
Anti-aliasing	4x
Sync Every Frame	No
Dual Video Cards	No
Shadows	Yes
Specular Map	Yes
Depth of Field	No
Glow	Yes
Number of Dynamic Lights	Normal
Soften Smoke Edges	No
Ragdoll	Yes
Bullet Impacts	Yes
Model Detail	Normal
Water Detail	Normal
Number of Corpses	Medium

We recommend using "Optimal System Settings." Manually changing settings could result in poor performance.

Depth of field effects: just say no.

address the issue just well enough to get a game going. Since they don't truly solve the problem they're not something that can be integrated into the Wine source code, but when building from source, you can add them in yourself.

Call of Duty 4 is a great example of a game that just needs a small patch to get running. It's amazing that it works at all under Wine – unlike *Team Fortress 2*, which is based on a three-year-old engine that scales down nicely, *COD4* runs on an all-new DirectX 9-only engine, so it pushes the graphics support in Wine to its limits. The frame rate isn't fantastic, and you do have to disable a few effects, but the single-player campaign at least is more than playable.

The patch (which is really for 3DMark05, though it works with *COD4* too) is available at **http://bugs.winehq.org/attachment.cgi?id=8548** – save its contents to a file called 'wined3d-alphablend-hack.patch'. Install Wine from source as above, but after running the 'make depend' step, add the patch, and then continue with the remaining steps:

```
patch -p1 <~/wined3d-alphablend-hack.patch
```

If you had already installed from source, there's no need to build the whole thing again – simply apply the patch as above, and re-run the steps after the "make depend" step. The build system is smart enough to only rebuild the source code files that the patch changed, so the rebuild will only take a few seconds.

To install *Call of Duty 4* itself, you should be able to just run the installer from the DVD, though I didn't have much luck with this. In the end, I had to install it under Windows and then copy the installed folder across to Wine's virtual C: drive, and then install a no-CD patch to get around issues with the copy protection routines. You'll also need to install 'd3dx9_34.dll' – just search for it online and download it in to your same folder as *COD4's* 'iw3sp.exe' executable.

> COD4 runs on an all-new DirectX 9-only engine, so it pushes the graphic support...

If you installed the patch correctly, the game should start without a problem – otherwise, the game will complain about missing alpha blend features. Once you have it running, you need to disable the 'Soften Smoke Edges' and 'Depth of Field' options to prevent graphical corruption issues, but beyond that, you can adjust the other settings as required to find a good balance between shinyness and frame rate.

Message in a bottle

With so many settings to tweak, both in 'winecfg' and in the Wine registry, it can be a major hassle to reconfigure Wine when you switch from one game to another. The alternative is to install each game in to its own virtual Windows drive, with separate registries, so that you can tweak each of them independently. There's a commercial version of Wine called CodeWeavers that does just this, calling the individual systems 'bottles', but you can do exactly the same thing with standard Wine:

1) Create a new folder to hold your Wine data and settings. As an example, we'll make one for *Call of Duty 4*:

```
mkdir -p ~/wine/cod4
```

2) Run the 'wineprefixcreate' tool on this folder:

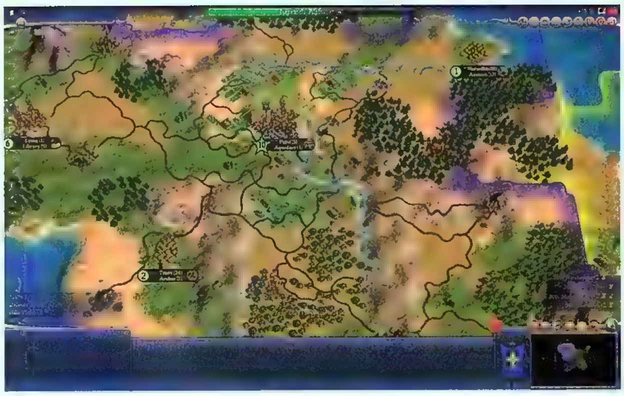
```
WINEPREFIX=~/wine/cod4 wineprefixcreate
```

If you check inside the folder, you'll now see a 'drive_c' folder and registry files, just like in your '~/.wine' folder. To run an application inside this system, set the WINEPREFIX environment variable when running 'wine', as we did with the 'winprefixcreate' command:

```
WINEPREFIX=~/wine/cod4 wine setup.exe
```

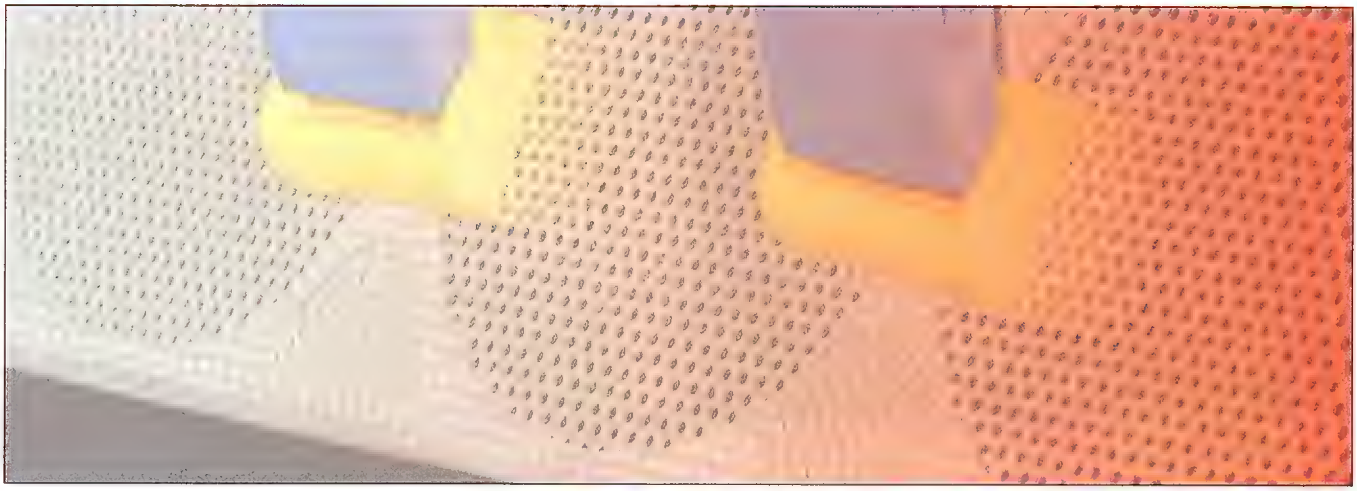
You'll have to specify the WINEPREFIX each time you run an application outside of your normal '~/.wine' folder. However, Wine is smart enough to automatically add the proper WINEPREFIX variable to any desktop or menu shortcuts created for installed applications, so if you launch everything through the desktop, it should Just Work (TM).

THE WINE LIST



We've only looked at a few games here, but there are dozens more that can run under Wine. To give you an idea of what can be done, we compiled this list of games, both current and – dare we say – vintage, which are all playable under Wine. It's by no means an exhaustive list though, so if your favourite game isn't listed, hit up the Wine website to see if it's supported.

- World of Warcraft
- EVE Online
- Guild Wars
- World in Conflict
- Command & Conquer 3
- Supreme Commander
- Elder Scrolls IV: Oblivion
- S.T.A.L.K.E.R.: Shadow of Chernobyl
- System Shock 2
- Fallout 2
- Peggle
- The Witcher
- Civilization IV
- Half-Life



DIFFICULTY **INTERMEDIATE**

Cooling Tower Tutorial Pt 02

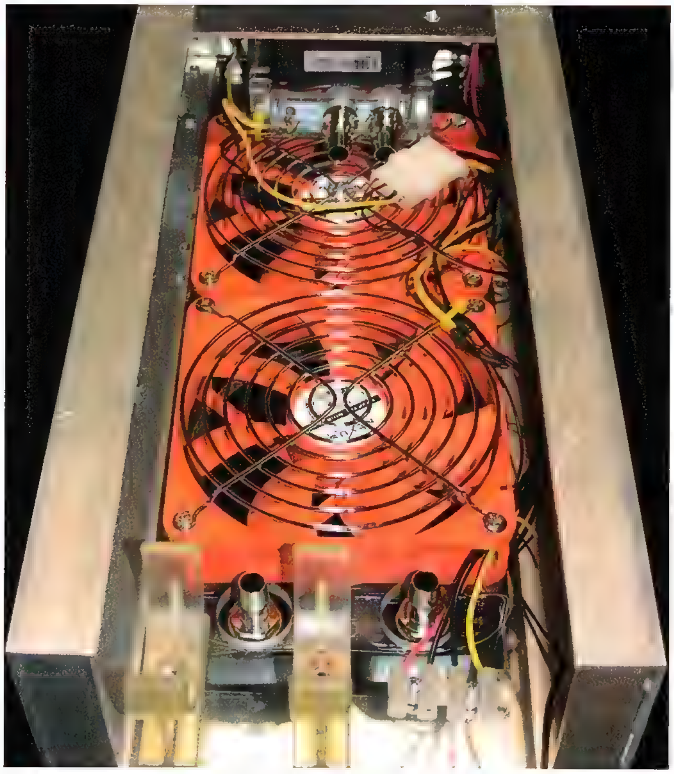
Ron Prouse breaks out his tools and spends some long cold nights in his shed, making us another marvel.

At the end of Part 01 of this tutorial the basic structure was complete, ready for the cooling components to be fitted. The water-cooling gear that we used is listed below, and these parts were chosen based on their performance attributes and economical footprint. The decision to use 10mm interconnects (tubing) was initially made based on available room, but this choice was supported by the excellent results that these 'new generation' components are capable of. It is worthwhile noting just how much water-cooling components have improved since this 'dark side' practise has become mainstream.

Ten years ago the options were pretty barbaric, with car heater cores, questionable pond pumps and home-made heat exchange blocks being the order of the day. Over the last few years, PC-specific components have undergone a huge research and development process, refining both performance and aesthetics to a point where building an efficient water-cooling system is a plug-n-play exercise for the average DIYer. We used a Coolplex Pro 10 reservoir (with 3/8in D-Tek Hi-Flow chrome plated brass hose fittings) as this will make servicing easier, while adding 100ml of additional cooling volume to the loop. The high quality brackets for the Pro 10 reservoir were mounted through the acrylic centre-plate, with the top of the unit pressed hard against the side panel. The additional 'hole' in the base is for an optional lighting module to be fitted – even though it adds visual 'cool', our reservoir is out of sight so fitting it seemed like a waste of effort.

The Laing DDC pump was mounted to a 2.5mm aluminium plate, which was then screwed to brackets on the inner-front sides of the body. All of the screws were counter-sunk to keep the underside of the base completely flat.

Although it may look simple, there are a heap of wires running through this project. The first step was to cut off all of the excess wiring on the fans, pump and LCD, and then plan out a new loom that will allow for specific, shorter lengths of cable, and reduce clutter. Rather than make up a single loom, Molex connectors were used to create three 'modules' that supply each of the functions – pump, switch and lighting. For safety and strength, all of the wiring joints were soldered, and then insulated with heat-shrink.The wiring loom terminates in a 4-port screw strip, which becomes the single point of entry for power. Our PC power supply has an external Molex connector on the



Fabricating a dedicated wiring loom will avoid most of the clutter.

SUPPLIES

PC CASE GEAR
http://www.pccasegear.com, Ph 03 9584 7266
Alphacool Laing DDC pump, $139
Alphacool NexXxoS Pro II, Rev 2 Radiator, $89
RadGrillz 2 x 120 stripes aluminium grill, $25
Alphacool Coolplex Pro 10 reservoir, $55
Thermaltake Water Temperature Indicator (CL-W0033), $49.50
3/8in D-Tek Hi-Flow chrome plated brass hose fitting, $4
Swiftech 3/8" inner dimension hose, $2.50/metre
Nexus 120mm Real Silent Case Fan, $29 ea

We also used 11 high bright white LEDs, a three pole switch, heat-shrink, chrome fan grills, Molex connectors, and strip connectors, all sourced from Jaycar Electronics, http://www1.jaycar.com.au/index.asp for about $40.

rear facia, so we will use a male Molex header to connect up to our loom.

The 240mm NexXxoS radiator was secured by attaching the 120mm Nexus fans to it, sandwiched either side of the acrylic centre shroud. The shroud will concentrate all of the airflow through its 120mm holes, stopping any air 'spillage' around the sides of the radiator. It is critical that you use screws that are the right length for this application, as longer screws could easily puncture the radiator core.

The use of fan grills is important in a confined area such as this, as they will stop errant wires and tubes from jamming or vibrating against the fan blades during use – and they are also a handy place to secure wires to with zip-ties!

Keep as many obstructions away from the fan airflow as possible.

The water margin

The water-circuit was laid out as: water in > reservoir > temperature sender > pump > radiator > water out. The logic behind this fairly 'regular' configuration is that the reservoir will trap any errant air bubbles, the sender unit will be reporting on the system temps, and the outgoing water is being cooled just before it flows to the water-blocks. The main installation concerns that had to be addressed were to keep all of the hoses curved smoothly (to keep them kink-free) while placing them to avoid restricting the airflow to the cooling fans, and to make sure that commissioning and servicing was a straightforward process. The latter issue is important, as there is nothing more frustrating than having to pull something completely apart to perform simple maintenance work – for confirmation of that issue, just ask a Ferrari mechanic.

One component that we weren't really keen on using was the water temperature sender unit, mainly because its small inner tube would add restriction to the water flow. This was alleviated to a degree by pulling it to pieces and grinding away as much of the inner metal as we could with a Dremel, opening up the pathway considerably. Warranty voided!

Notice the lack of hose clamps? The D-Tec barbs simply didn't need them, grabbing the Swiftech tubing with a vice-grip that defied nature. We decided to fit some clamps later, but mainly as a precautionary measure as the system proved to be leak-free.

Commissioning the system is reasonably straightforward. With the water-blocks attached, and all joints checked to make sure they were tight, the external unit is flipped onto its top and the reservoir unclipped from its fitted position. The reservoir is supported in an upright orientation, and the top can be unscrewed. At this point the reservoir is the highest point of the system, so it is just a matter of slowly filling up with coolant and letting the air bleed out. When it is 80 per cent full, the pump can be started and the last of the air purged under circulation. Once the worst of the bubbles have cleared, the tank is topped up, the lid secured, and the reservoir can be clipped into its normal position. The cooling tower can now be flipped back over onto its base, ready for use.

TOOLS

The tools used in this tutorial are mainly those found in the average workshop, including a drill press and drills, linishing machine/disc sander, ½ sheet electric sander, 100mm grinder, router, Brasso metal polish, epoxy glue and a selection of hole saws. The main requirement is a decent bench or table, providing a solid, flat surface to operate on.

DISCLAIMER

Whenever you pick up power tools, cutting and grinding instruments, or even a can of spray paint, you are putting your general wellbeing at risk from some form of industrial level accident. We take every precaution by wearing appropriate safety equipment, using tools with respect and within their limits, and by not inhaling the contents of glue and paint containers. We suggest that you should follow a similar regime, and seek professional assistance and guidance if you are attempting a task outside of your skill set.

NB. Atomic MPC and staff are not responsible for your safety or longevity.

Hard wired

We are going to give this next step plenty of space, partly as it is slightly confusing, but mainly because it has a million uses in any case mod. Sealed PCB rotary switches are a brilliant way to switch various currents to several components in one neat unit. One rotary switch can replace several toggle switches, and take up far less room. To build a simple dual-voltage switch requires the following:

- 3-pole rotary switch – (Jaycar Cat. SR-1214)
- Switch Knob – (16mm Brushed Aluminium, Jaycar Cat. HK-7020)
- Molex Plug – (M & F – Jaycar Cat. PS0742 & PS0743)
- Colour-Coded Wire – (Dick Smith Cat. W 224X)
- Heat shrink – in suitable sizes.

The hardest part is getting your head around the wiring! In this picture I have tried to simplify the concept, so lets see if this description makes it any easier.

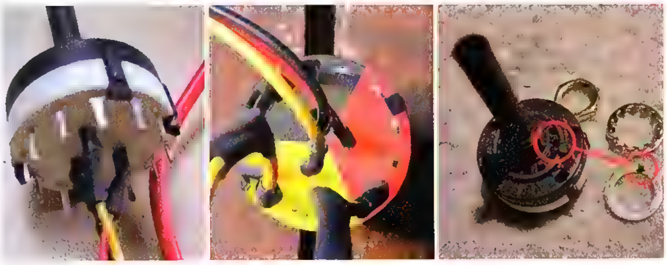
The switch has three central posts, which is where the power enters the switch, labelled as A, B, and C. Around the outside are 12 output points, and on a three-pole variant (they also come in one, two and four-pole) each of the inputs 'owns' four of them. In the picture I have coloured-coded the three quadrants as if they were connected to a Molex plug like so: Yellow wire to A, so 1, 2 ,3 and 4 are 12V points; red to B, so 5, 6, 7 and 8 are 5V rails; black to C, so 9, 10, 11 and 12 are 0V (ground for the yellow/red).

On front of the switch, under the nut, there is a washer with a lug on it. Depending on which hole that you position the lug into, you can change the number of switch positions available, usually between two, three and four stops. In a 7V/12V application you will use the hole marked one, for two switch positions.

This is where it gets tricky…

On switch position one, outputs 1, 5, and 9 are connected, while on switch position two, only outputs 2, 6 and 10 are connected. Etcetera.

By choosing which outputs that you use for each switch position, you can have different output voltages, including 'off'



Wiring a 3-pole switch is logical – isn't it?

Lights – you knew that there had to be lights!

points. No, it isn't as hard as it looks! Break it down into three sections … three wires (yellow, red, black) from a Molex plug into the centre of the switch, four wires from the pins of the outer ring of the switch and two wires (positive and negative) to the fans.

So, to achieve a 7V–12V configuration we will have to wire up as follows:

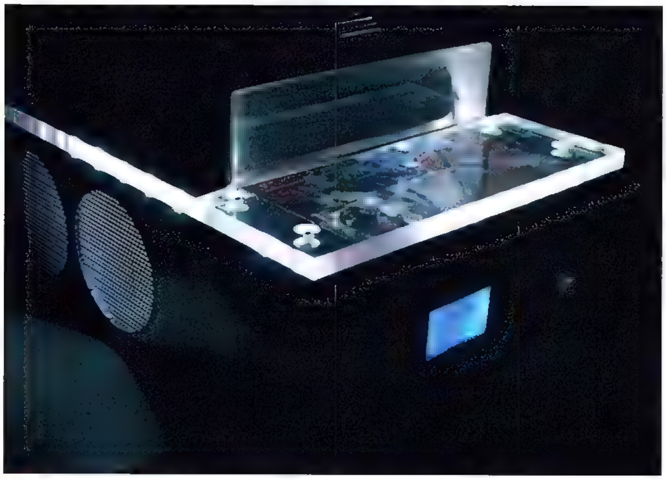
Position one will be outputs 1(potential difference 12V – 5V = 7V) and 5 (ground), while position two will be outputs 2 (12V) = 12V) and 10 (ground).

The last step is to connect the yellow and orange wires to the fan positive, and the two black wires to the fan negative – relax, there won't be shorting-out issues as the red (5V) and the yellow (12V) won't be active at the same time.

Make a point of 'nipping off' any of the terminals that you are not using as close to the plastic body as possible, to avoid any short-circuits; or even cover the 'stumps' with non-conductive silicone if you are really paranoid.

Also note that every connection point has been insulated with heat shrink. In this instance, the dual voltage switch was used for the fans only, while the water-pump was wired separately at a constant 12V.

The next part of the project is a variation of an LED array. We had decided to leave the front section of the body clear, so that the pump is visible through the 'window'. The only issue was that it needed some lighting inside the front of the casing to illuminate the internals. An array of five 5mm 2000mcd high bright white LEDs mounted in the acrylic shroud on each side of the radiator would suffice, and simultaneously illuminate the outer-edge of the shroud along its length. The simple way to do this is to build a 'jig', or template, that is a copy of the final application. A scrap piece of 6mm thick acrylic was drilled with 5mm holes at 20mm centres, and then the LEDs prepared for the correct incoming voltage with a current limiting resistor. There are two ways to do this; you can have one resistor for each individual LED (in parallel), or you can connect all of the LEDs together, and have one resistor for the string (in series). For complexity's sake, we went with the parallel option – actually, it is just a habit that cant be broken.

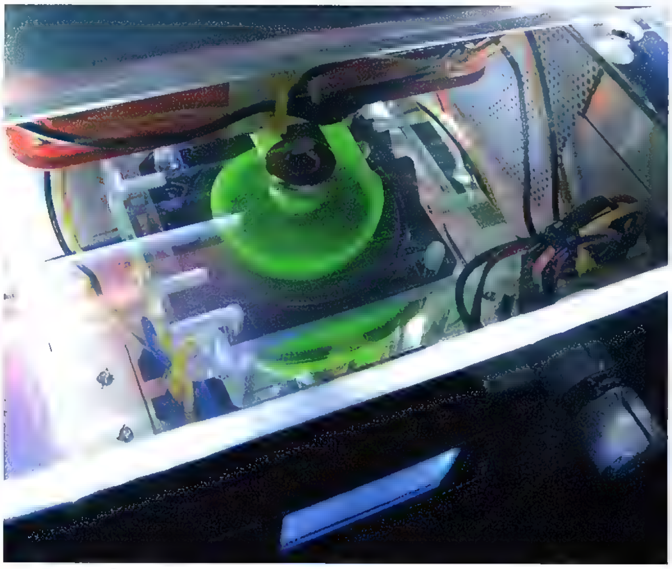


High/low fan speed switching has a visual impact.

Clipping the anode (longer leg) of the LED down to 5mm, a suitable resistor was then soldered to it. An example can be seen at the top of the picture. To make sure that you have the right value resistor, have a look at this on-line calculator: **http://www.luxeonstar.com/resistor-calculator.php**.

We placed the LEDs in the holes, and then bent all of the cathode (shorter legs) over at 90°C and soldered them together. The cathode (or negative) connections don't need to be insulated in most cases; it is the anode (positive) that you have to worry about. Heat-shrink was placed over the anode connections, and lead wires soldered on to each positive leg. When finished, the assemblies were tested, then lifted out of the jig and glued into the pre-drilled acrylic shroud.

The two LED arrays were wired together, and then powered through the 7V–12V switch outputs to the fans. The concept was to give a visual indication as to the 'power mode' that the unit was in. At 7V, the LED's are 'over resisted', and glow at approximately 60 per cent of their 12V level of luminosity. So, as can be seen in the picture, when the cooling tower is running in 'low' power mode the lighting is appreciably dimmer than when it is on 'high'.



There is something very special about green coolant.
And pumps.

The view through the front window

The idea was to leave this area looking slightly industrial, with unpolished aluminium and exposed screws. The Laing DDC has an aperture designed to take a 5mm LED, so an additional white light was wired into the pump's 12V power supply, adding to the aesthetics by highlighting the green coolant and giving the pump edges a neon glow. All of the wiring was tidied and zip-tied into position, but it was just too busy to use cable braid effectively.

The finished product

It's still not the prettiest face in the crowd, but a great 'proof of concept' outcome. The concept? To create a secondary cooling loop that can be dedicated purely to cooling multiple graphics cards, and be easily removable without having to upset a primary water-cooling system. The inlet/outlet hoses can be routed through the rear of the case, and a simple modification made to enable the GPU water-blocks to pass through while still connected.

Aesthetically, the unit will mount to any flat-topped case, and in this instance the upper cowling match any brushed aluminium finish The LCD readout on the front is clearly legible, and the fan-speed control knob is easily accessible.

The final outcome. Beauty is in the eye of the beholder.

Polished aluminium is hard to photograph, so you will have to take our word for it that the mirror-finish bodywork looks great 'in the flesh', and that the white lighting makes a real statement in low light conditions. The high/low setting helps to give the system some added functionality.

Mounting the unit can be done in several different ways; double-sided tape or Velcro would work if the case is perpetually stationary, but the method we prefer is to use speaker grill clips, Jaycar Cat# CF2761 (see inset). These are easy to use; simply drill the hole and push them in. The male section requires a 4.5mm diameter hole, 5mm deep, while the female socket requires a 10mm diameter hole with 15.5mm clearance under it – be careful drilling in areas around the PSU in an ATX case.

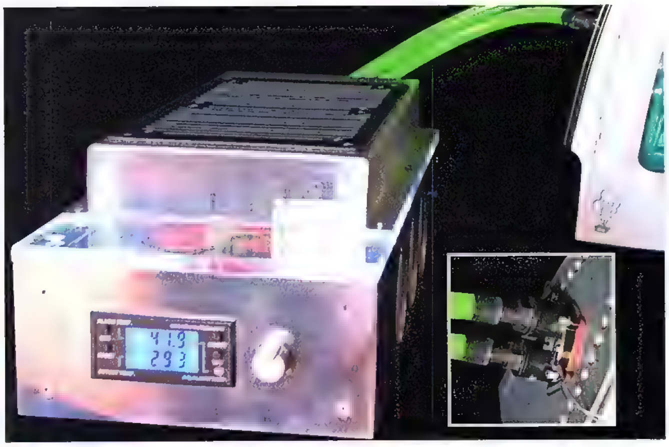
The test – does it work?

Looks aside, does it actually work? OK, this testing method might be a little avant-garde, but you make do with what you have!

Using a clothes iron set at a constant 95°C, attached to a Swiftech MCW30 chipset water block at 27.2°C ambient air temperature; the Thermaltake probe readings were 31.1°C on the 12V fan speed, and 33.8°C on the 7V fan setting after 30 minutes. The temperature could stabilise the increase/decrease after three to four minutes of varying the fan speed.

The noise output is negligible, with the Nexus fans and Laing DDC pump only slightly audible at full speed, and totally quiet on the low setting.

For all intents and purposes, the project is a success!



Don't forget to wipe off the Arctic Silver before ironing your white shirt.

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She decided to study a broad degree in multimedia combined with a business/enterprise major. "My degree gave me flexibility and variety. I loved how I could study digital design and art, programming, project management and business all in the same course. My multi-discipline course plus Monash's IT's great reputation gave me plenty of opportunities for the best jobs in the industry. Monash also has a great community and culture and I liked how I could take units at different campuses."

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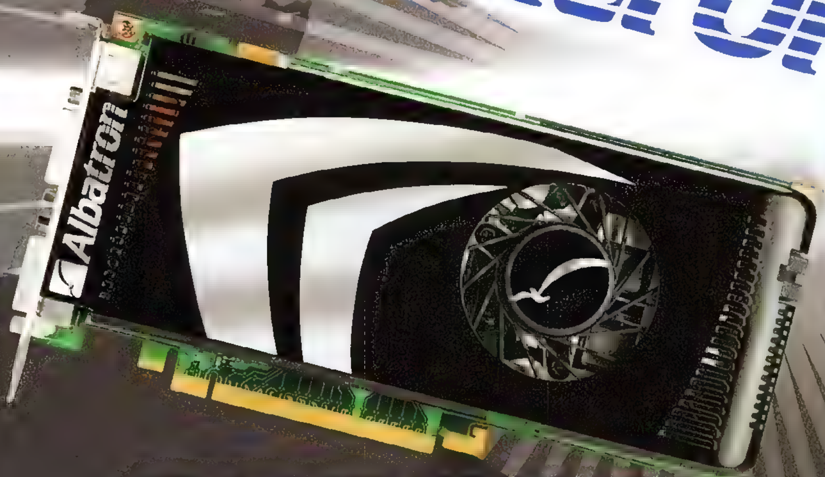
Albatron



9600GT

8800GT-512X

8800GTS-512X

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GRAPHICS BY NVIDIA

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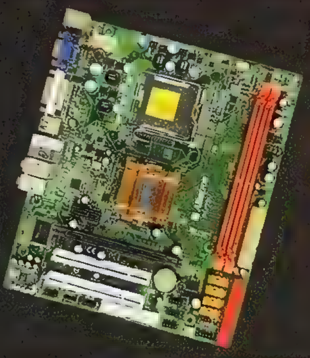
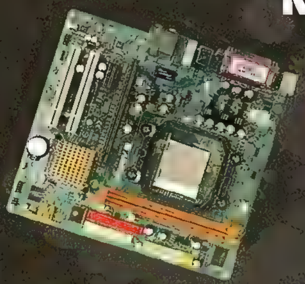


PM73V

- DDRII (Dual channel / Overclocking)
- FSB 1333Mhz
- PCI-E x16
- SATA II
- 6ch HD Audio
- 10/100 LAN



KM61S-AM2

- Dual DDRII 800
- HTT 1000
- Universal PCI-E
- SATA II
- 8ch HD Audio
- 10/100 LAN

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No surfing the Atomic forums during class, students!

It's not all beer and skittles

Chris Taylor ponders the rigours and distractions of university life...

Tis that time of the year again – universities around the nation have just gotten back into the swing of things. And, in turn, many a first year student has just endured their first week or two in the big bad world of tertiary education. If you're in that situation, this here is your survival guide.

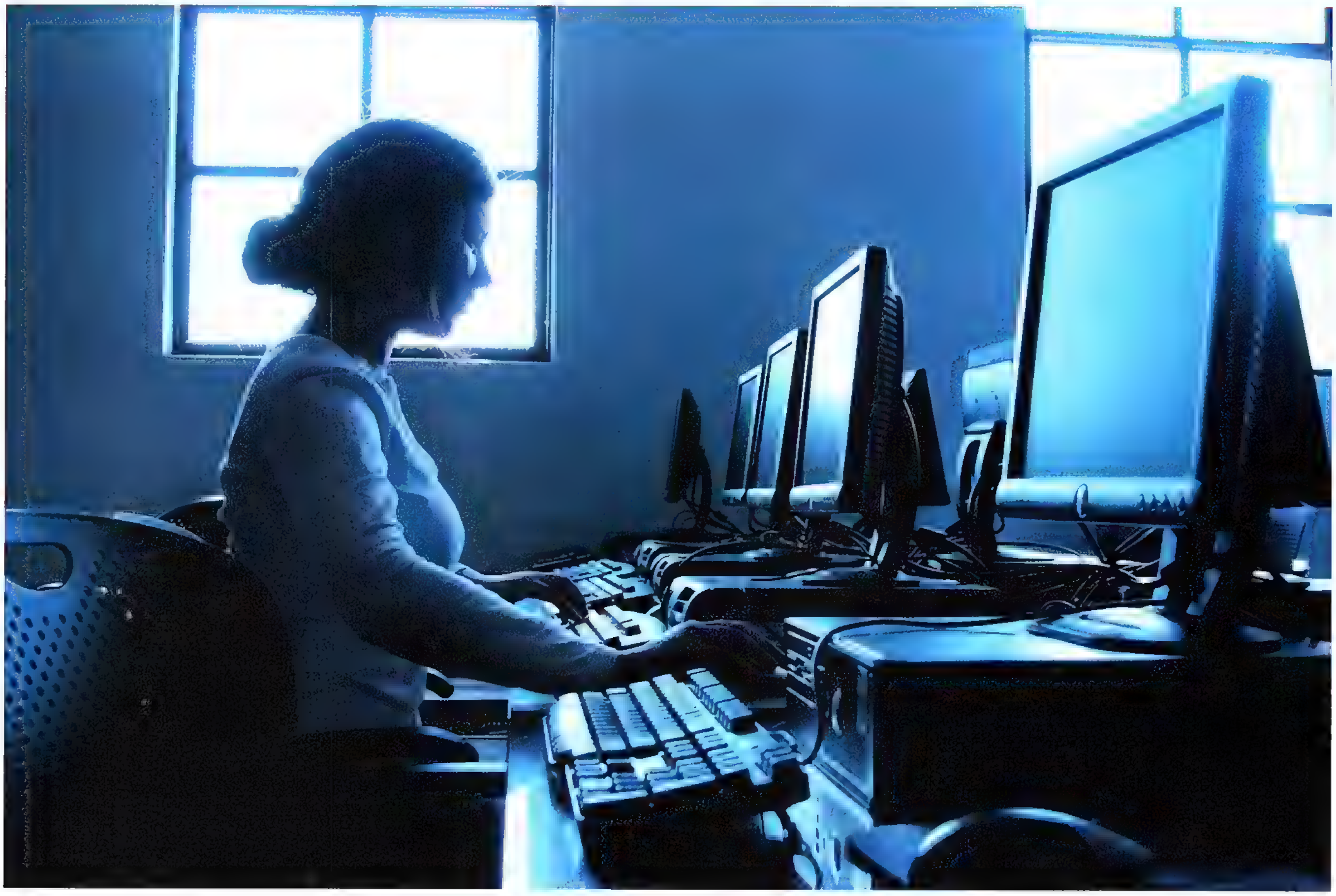
Boobs, beer and tribunals

While TAFE may, at times, feel like quite the glorified secondary school, university is different. The university system is all about self-sufficiency. No one is going to make you come to class. No one's going to keep reminding you to do your readings, to ensure you keep pace with your classmates, to do your bloody assignments. And you will be hit with assignments within weeks of starting university. Hell, by the time you read this, you're probably already looking at two or three. It's oh-so-easy to just slack off in university. In most courses, at least, little is demanded of you by way of contact hours. The readings are quite often horrendously dull, drab works penned by academics that couldn't communicate clearly if the life of a cute bunny rabbit depended on it. And, too, the campus itself is probably a helluva lot more interesting than the school you just left. There's a greater variety of food, an on-campus pub and, yes, quite the oversupply of members of your preferred gender(s) wandering about – this last point being especially relevant to those of you who've emerged from a half dozen years at a single sex school. Don't get caught up in all this stuff. It's fun, to be sure, but allow us to put it plainly – if you screw up, there's no one who's going to catch you. Certainly, if you fail core units you can repeat them, but do this too often and you will find your arse hauled in front of a tribunal so you can justify to the university exactly why they should continue wasting their time on you.

> “Allow us to put it plainly – if you screw up, there's no one who's going to catch you!”

The game changes

The above advice applies equally to all – from arts students to future dentists to you, the IT padawan that's just started university. With IT, though, you've even more differences between the university system and secondary school to get your head around. Presumably, if you were given the option, you took some sort of computing subject in your final year of schooling. Maybe it covered a little coding – Visual Basic, Java, maybe something like Robo Inventor. You might've been okay at it, walking away with decent marks. Don't assume you'll be able to do the same as easily in university. Here, coding isn't really taught per se. You're given the theory and, every week or so, a



few new instructions you can play with, but there's none of this line-by-line, here's how we get Visual Basic to do *x* business. You need to think for yourself. You need to devote a helluva lot of your spare time to pouring over your notes, reading the textbooks – and recommended readings, too, if the assigned textbook is shit or if it's an especially difficult week – and just fiddling around in Java, C++ or whatever language you're supposed to be learning. On that note, the lecturers of most first year units will tell you they've assumed no knowledge on your part. When it comes to programming units, at least, they're lying. They all are. Well, okay, they don't assume knowledge as such, it's more that they move at a pace that will see you – unless you're really quick or, yes, have prior experience with the language – overwhelmed.

> “You need to devote a lot of spare time to pouring over your notes, reading textbooks...”

Perhaps it's a bit late now – what, with the semester already having started – but in the weeks leading up to you starting a programming unit, it's always worth having a crack at the lessons in one of those *Learn XYZ in 21 Days* books. The point isn't to walk into the tutorial room knowing a lot of instructions. That's really not necessary. What you do need, though, is to already be comfortable with the basics of the language. It'll help you – and improve your results in assignments and exams – immensely.

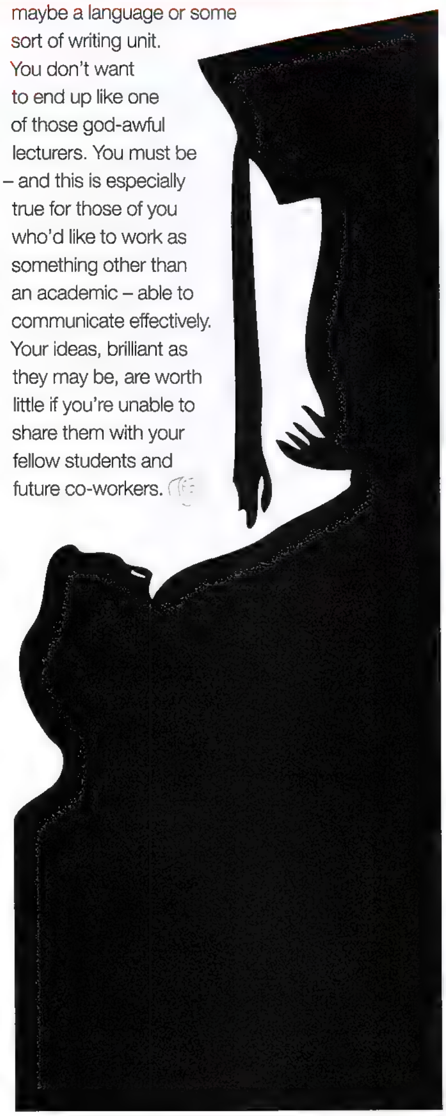
Working on your problem solving skills is a worthwhile exercise too. Being able to solve problems will help you as much – if not more – as knowing a bit of the language. Also, in school, you probably noticed you could do very well working by your lonesome. This remains true for some people in university, but really, do your best to assemble a group of friends so, when you just don't get something, you have people to ask for assistance. In turn, you can help them with their problems. Yes, you will have tutors and lecturers to go to, but never underestimate the value of a fellow student's advice. You will have units in which the lecturers and tutors are utterly incapable of helping anyone with anything. You'll have no other option – assuming you want to pass – but to work with your classmates. Join IT-related student societies for this very reason. They'll either be free or close enough. Trust us – you wont regret it. We do keep pointing out that you may have problems with textbooks and lecturers for a reason. In all fields – but maybe especially in IT – you'll occasionally have to deal with crappy resources.

There are ways around this. If the textbook sucks, go see the lecturer – assuming they don't suck – and see if they can recommend another one. Probably there's already a list of good ones in the unit guide. And, obviously, if you're having trouble with a specific area of a programming language, you can always just plant your arse down in the relevant section of the campus library and flick through books until you find one that's suitable. If your lecturer sucks, you always have a tutor. If your tutor and lecturer happen to be one and the same, see if you can get moved to another tutorial. If your tutor and lecturer aren't the same – bar the fact they both manage to be spectacularly useless – then your fellow students are the way to go. Hey, you're a geek, right? And you're a reader of Atomic. Post on our forums. And on other forums, too. A lot of people will be willing to help you out. And even if it's 2am – maybe especially if it's that time – you shouldn't have to wait too long for a response. In your first year especially it's an absolute pain to find yourself dealing with a difficult unit that's helmed by the worst staff the university managed to dig up, but believe it or not, it is in some ways beneficial. A learning experience. Once you get into the real world of the work place, you'll find yourself having to deal with even worse excuses for humanity. No matter the quality of the teaching staff and assigned resources, though, remember one thing – you're not going to learn a programming language by simply reading or asking questions about it. You must practice. Do all the in-class tasks. Attempt all assignments as soon as you're given them. Have a go at any and all examples in the books you read.

Don't become a drone

Too many people – in their first year, at least – treat university as if it were school. They attend all the lectures and tutorials, but do little work at home. Or, if they do, they do only what their lecturers and tutors have asked of them. Usually, that's enough to pass units. What they fail to grasp is that IT at university – or, hell, anything at university – is about more than learning how to complete assignments. If you're only there to get HDs, youre missing the point. University is meant to teach you how to think. You're not only supposed to be self-sufficient enough to seek out a book better than the assigned text without prompting because you need it for the second assignment; you're meant to become a well-rounded individual who, when faced with a problem, can think about it logically, laterally and critically, then seek out a solution. A lot of people are able to get into university and finish a degree. And a lot of these people remain fools. You should be different. While you might be paying thousands – either now or a few years down the track care of HECS – to have some of the brightest academics pass on their knowledge to you, you must be prepared to study in your own time. Even if what you're going to study isn't going to be relevant to how you perform in the next assignment or the end-of-semester exam.

On that note, do pick electives that aren't related to IT. Once you've got the major and the minor – assuming you're doing one – worked out, ensure you leave some electives aside for other things; maybe a language or some sort of writing unit. You don't want to end up like one of those god-awful lecturers. You must be – and this is especially true for those of you who'd like to work as something other than an academic – able to communicate effectively. Your ideas, brilliant as they may be, are worth little if you're unable to share them with your fellow students and future co-workers.



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I/O

Daniel Rutter's getting himself all hot under the collar dealing with reader problems.

I/O OF THE MONTH

First it fills the 0 capacitors, and then it gets to the 1s

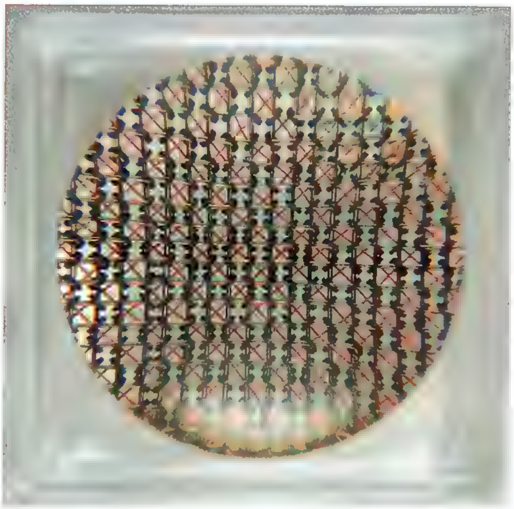
I remember the global unease with the idea that your new Compact Disc was actually read from the inside out. It was microwave cooking all over again! (Microwaves and inside out cooking was the best global marketing scam EVER!) Our conventional ovens still made a great roast and my LPs still happily trundled along from the outside in, with a comforting white noise hiss (something else that went missing in the transition). and had done, since before I was a child.

Now we approach the end of another storage and playback medium. The hard disk drive, and its sweet, return to form, outside-in read/write method. On a round disk, too!

Flash memory approaches as the new bulk storage format. But it's not new – only the size and reliability are.

So my question is, for nostalgia, is there a physical/topology-driven method to memory address allocation in Flash, or ordinary RAM? God knows you can't spin the things. Well, not with any real effect anyway.

Paul Saltmarsh



Memory addressing was easier to visualise in the olden days.

The write pattern for Flash memory actually changes on the fly. 'Wear levelling' code in the firmware for all modern Flash RAM devices makes sure that even if all you do with your 1GB of Flash memory is write a 1MB file to it, delete it, write it again and repeat – actually, even if all you do is open the device with a freakin' sector editor and write over and over to the first blocks on the 'disk' – you'll actually end up distributing your writes evenly over the whole device. This is to prevent repeated writes to one area from wearing out that area when the rest of the device is still perfectly fine.

You could do wear levelling with hard drives too, except (a) it's not really necessary, since the parts of hard drives that wear out are not the magnetic particles on the platters, and (b) you'd end up with a very, very slow hard drive, as it did zillions of seek operations all over the place.

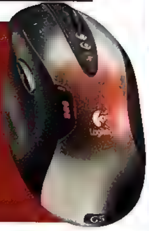
Wear-levelled flash RAM does lots of seeking too, but because it's a solid state device, that seeking takes nearly no time at all.

Ordinary RAM doesn't wear out like Flash, so it's addressed in a more straightforward way.

Basically, you can think of the chips on a memory module as being like a bunch of hard drives in a striped RAID array. The data for each write operation is split between all of the chips on the module. Rambus RDRAM (which hasn't exactly set the PC world alight...) works differently, and can concentrate the whole of an operation, and thus of the power and heat created by that operation, on just one chip on a module. That's why RDRAM modules need heat spreaders.

I/O OTM wins a Logitech G5!

There's a mouse in the house. Okay, it's not in the house, it's in IO. And it looks damn good.



Scrape it off with a chisel

In the process of installing a Cooler Master water cooling unit onto my CPU, I removed the CPU from the motherboard and got a little thermal grease on the underside of the CPU (the part that touches the motherboard). I quickly wiped off the thermal grease. I have not run the computer yet. Do you think that I have ruined my computer by getting some the thermal grease on the underside of the CPU?

Please answer me! I am desperate!

William Patrick

Don't worry. It'll be okay.

Some thermal grease is metal-loaded, and conductive; it's a bad idea to have that on the bottom of a CPU, bridging contacts. Almost all thermal grease is non-conductive, though, precisely because it could otherwise cause havoc almost anywhere it happened to land.

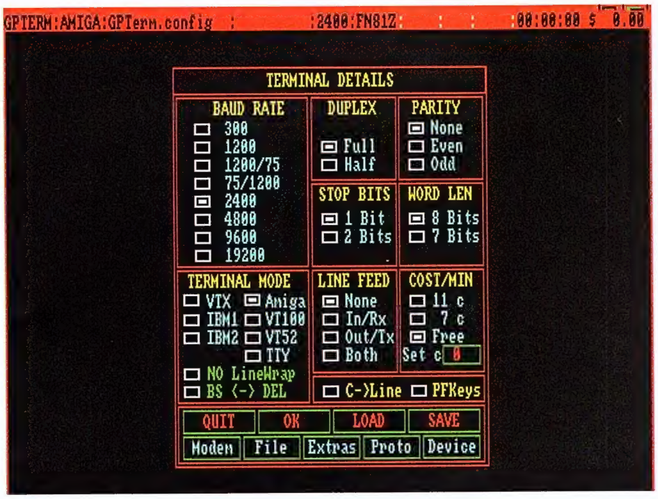
If you've got a modern Ball Grid Array (BGA) CPU, with little pads on the bottom of the CPU and pins in the CPU socket, then it's possible that grease actually still on the bottom of the chip could interfere with the contacts. Really spreadin' the stuff like peanut butter onto the bottom of a standard pin-type CPU could cause similar problems. It's also possible that you static-zapped your CPU while you were wiping the stuff off.

But none of this is very likely at all. You'll probably be fine.

Naphtha (Zippo-type) lighter fluid is a good solvent for thermal goop, by the way.

In 1988, 700Mb took a month

I have a 256k-ish broadband connection, which is actually pretty great, where I live. But when I download files I get a scant 40 kilobytes



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GPTERM:AMIGA:GPTerm.config  :          :2400:FN81Z:   :   :     :00:00:00 $  0.00

                    TERMINAL DETAILS
           BAUD RATE        DUPLEX     PARITY
           ☐ 300                       ☒ None
           ☐ 1200          ☒ Full      ☐ Even
           ☐ 1200/75       ☐ Half      ☐ Odd
           ☐ 75/1200       STOP BITS   WORD LEN
           ☒ 2400          ☒ 1 Bit     ☒ 8 Bits
           ☐ 4800          ☐ 2 Bits    ☐ 7 Bits
           ☐ 9600
           ☐ 19200
           TERMINAL MODE    LINE FEED  COST/MIN
           ☐ VTX  ☒ Amiga   ☒ None     ☐ 11 c
           ☐ IBM1 ☐ VT100   ☐ In/Rx    ☐  7 c
           ☐ IBM2 ☐ VT52    ☐ Out/Tx   ☒ Free
                  ☐ TTY     ☐ Both     Set c 0
           ☐ NO LineWrap
           ☐ BS (-) DEL     ☐ C->Line  ☐ PFKeys
           QUIT    OK      LOAD     SAVE
           Modem  File  Extras  Proto  Device
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Kids today, I don't know... Hey! Get off my lawn!

per second, at best.

Is there a way for me to download files using all 256k? As in, not use most of it for nothing as I leave my computer on all night to download a 700Mb file?

Zeke

First up, a '256k' connection is a 256 kiloBIT per second connection. 256 kilobits is 256,000 bits, because transfer speeds are specified in powers of ten, not powers of two. A byte is eight bits, a kilobyte is 1024 bytes (which is a power of two), and so a '256k' download speed means no more than 31.25 kilobytes per second. Take protocol overhead into account and you can expect to download no more than 25 kilobytes of user data per second. And at that speed, 700 megabytes will take almost exactly eight hours to transfer.

You also can't get a file faster than the source – or sources – of that file want to send it to you. For P2P downloads of files that don't have tons and tons of peers, it's normal to only get a few tens of kilobytes per second, if that. The same applies for downloads from random servers out on the internet somewhere; there can be more than one bottleneck between you and them.

Download manager software can fetch a file using multiple parallel transfers from the one server, which can in theory make the transfer faster. This 'segmented' downloading seldom actually helps much, these days.

Most ISPs have local servers that host OS patches, game demos, Linux disc images and other such freely distributable large files. If you can download the thing you want from there, you'll get it as fast as from anywhere, and it probably won't count toward your bandwidth allowance, either.

If downloads from a local server like that are still slower than they ought to be given the alleged speed of your connection, the problem is likely to be at your end. If you have a DSL connection, it's quite common for bad phone wiring – usually in the house – to greatly restrict the connection speed.

640 by 350 ought to be enough for anybody

I am trying to understand why there are a lot of LCD displays with screen resolution 1366 x 768, but HDTV resolution is 1280 x 720 (doesn't matter if it's 720p or 720i, I suppose).

But the next step of HDTV, full HD, is 1920 x 1080, and some new LCD TVs really have this resolution. I believe that's the way it should be.

Why are manufacturers of LCD TVs pushing displays with resolution slightly higher than needed for displaying 1280 x 720?

Does it mean that there will be 24 black lines above and under the picture, and 43 black columns left and right of the picture?

With plasma displays things are even more strange – 1024 by 768 resolution is pretty common, but the screen's aspect ratio is 16:9, not 4:3.

Does this mean the pixels are not square? Why this whole mess?

Dario Smoljak

I don't know exactly why the 1366 x 768 'intermediate' resolution is so common in the LCD TV industry.

1366 by 768 is a reasonably standard PC resolution; it's the widescreen version of 1024 x 768, and is sometimes known as WXGA. There aren't many (or any...) large-screen WXGA PC monitors, though, so you wouldn't think the panel companies would have any particular need to make screens with those dimensions. Perhaps standardisation of screen driver hardware has something to do with it, or making it easier to drive LCD TVs from PCs, or something.

But no, there won't (necessarily) be any black bars if you view HDTV on such a screen. The image will be scaled to fill the screen, if its aspect ratio permits. 1366 x 768, 1270 x 720 and 1920 x 1080 all have a 16:9 aspect ratio, so any image that fills one of those screens will fill any other. Modern scaling hardware generally does a good job of this, though you obviously lose definition when scaling down and don't gain any definition when scaling up.

The resolution you can actually perceive on a screen varies depending on its size, its distance from you, and your eyesight. I talked about this a few years ago in **http://www.dansdata.com/gz029.htm**.

As I said then, if you take the gold standard visible resolution for a screen three metres away to be no more than 30 dots per inch, you've got a 1920 x 1080 screen, Pythagoras tells us its diagonal is 2203 pixels, which at 30dpi means the diagonal has to be at least 73.4in. Which is pretty frickin' huge.

If you've got a mere 40in 1366 x 768 screen at that same distance, you'll have 39 dots per inch, which is probably already above what you can see, even if you waste a bit of the resolution by upscaling a DVD onto it. There'll be little to no visible difference if you upgrade to a true HDTV screen of the same size; you'll either have to sit closer or make the screen quite a lot bigger for a difference to be noticeable.

And yes, the pixels of 16:9 1024 x 768 plasma screens are rectangular. The minimum feature size for plasma screens is quite large, which is why their resolution is always relatively low. I don't know whether it's a feature size issue that forces them to use rectangular pixels, but they often do.

create your own game and win

swingame08

Swinburne's Faculty of Information and Communication Technologies invites all Year 11 and 12 students in Australia to participate in the SwinGame 08 games design competition.

This competition is an exciting opportunity for students to showcase their technical and design skills by creating a 2D game using the SwinGame game development kit. Games can range from arcade, adventure through to sporting themes.

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FALLOUT Funnies and humour from the fallout zone

Turok, My Father

Logan Booker provides Turok with some alternatives to random violence.

I don't think I could be a dinosaur hunter. Not like Turok.

He's a man's man, really he is. Not the sort of man's man your granddad warns you about, but the type of muscled hero that's not scared of anything. Not even the stinking, horrid mess at the bottom of your bin. The one you know you'll eventually have to clean up, if only you could get within three metres of it without dry retching ad nauseam.

Yes, Turok is fearless, just like a pumpkin. Not even our scaly friends could convince his bowels to convert his underpants into a port-a-loo.

And I use the word 'friends' because that's what they are. Well, what they *were*. As we all know, dinosaurs died out about 65 million years ago. It was because of a meteor, or dust, or the death of vegetation. Somehow they became extinct, just like the dodo or blue Pepsi.

So Turok, according to the latest game, comes face to face with these beastly quadrupeds. What's the first thing he does? He stabs them in the head with his knife.

Now, I'm no expert on first encounters – just ask any of my numerous ex-girlfriends – but doesn't one traditionally avoid the use of anything *knife-shaped* when confronted with the opportunity to examine a life form no human has seen like, ever? I know they have teeth and the intelligence of a rather smart dog, but just because *Jurassic Park* portrayed dinosaurs as a man-eating, Sam Neill-hunting fiends doesn't mean that it's true.

So yes, while Turok proved that he can dispose of creatures twice his size and weight with nothing but a serrated edge and a mohawk, he also demolished any future avenues for diplomatic relations.

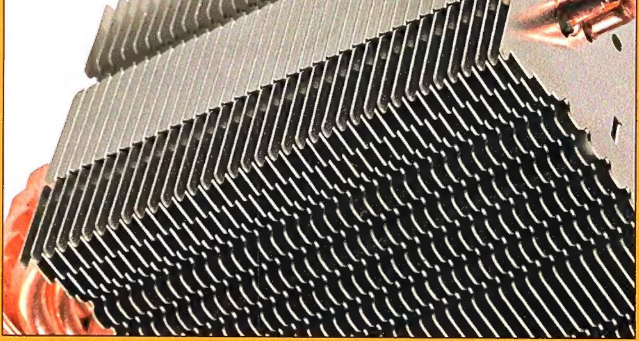
What Turok should have done is opened with scones. That's right, I said scones. Nothing calms me down more than a freshly baked bready treat. Jam and cream is a plus, but I can make do with a slice of butter and a spot of tea. True, archaeological studies have shown that dinosaurs came in one of three varieties – herbivores, carnivores or a mix of the two – but even the most hardcore of vegans have collapsed under the weight of those flour-dusted buns.

If, for some crazy reason, they're not partial to scones – it's cool. Sternly-worded letters, or even just letters that *suggest* you want to be stern, have worked wonders. No stop sign before that nasty crest? Letter to the local member. Rent is too high? Fire off a parchment full of strong adjectives to your landlord. Heck, you could even wrap a scone with your letter and send that.

See Turok, you don't have to be a dinosaur hunter. You could have been a dinosaur ambassador or friend of the dinosaur. But no, you had to go all Crocodile Dundee on their arses and now we're flushing the damn things from the rafters with brooms.

Next time you're faced with an extinct species, think twice about drawing that blade of yours. In fact, swap that grenade bandolier for a picnic hamper and let me know how you go.

NEXT MONTH



GOT GAME?

We take a look at the wide world of amateur game design, and show you how to design and distribute your gem to the masses. This time for sure!

HOME SERVER

Could it be? Has Microsoft actually released a really useful product, that actually works, and is easy to extend and customise? Wow!

HACKING

Dan Rutter keeps it real and takes a look at how hackers really operate, and how they do what they do.

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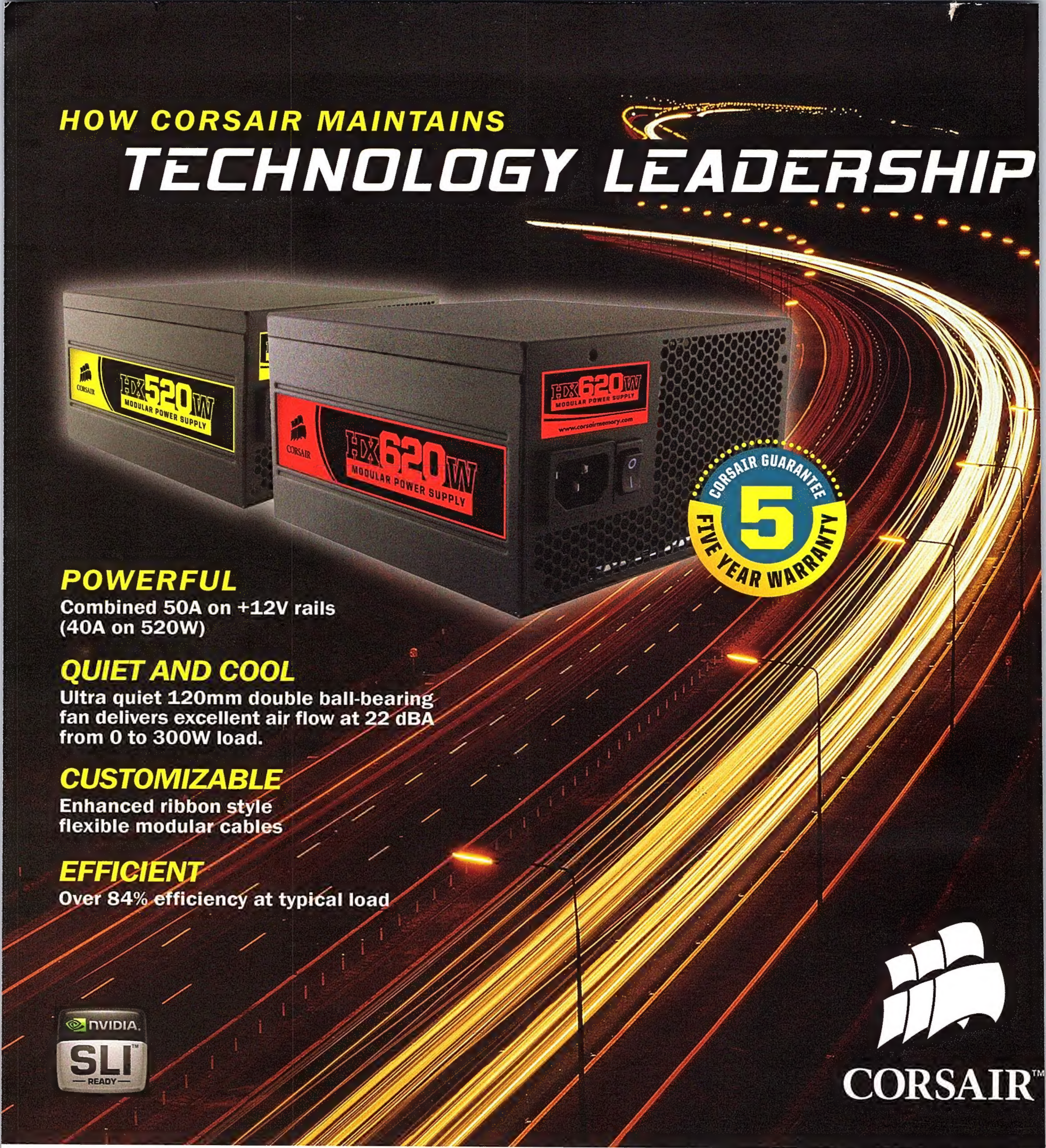
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